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TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

PUBLIC HEALTH BULLETIN No. 71
MAY, 1915

STUDIES IN VOCATIONAL DISEASES

I. THE HEALTH OF GARMENT WORKERS

By
J. W. SCHERESCHEWSKY
Surgeon, U. S. Public Health Service

II. THE HYGIENIC CONDITIONS OF ILLUMINATION IN WORKSHOPS OF THE WOMEN'S GARMENT INDUSTRY

By
J. W. SCHERESCHEWSKY
Surgeon, U. S. Public Health Service
and
D. H. TUCK
Assistant Physicist, U. S. Public Health Service

PREPARED BY DIRECTION OF THE SURGEON GENERAL

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INTRODUCTION.

While it is self-evident that the health of workers and the hygienic conditions under which industries are carried on have always been of fundamental importance to society, it is only within the past decade or so, in this country at least, that these questions have begun to receive their merited recognition as a part of the general problem of safeguarding the public health. In the past the true correlation of conditions affecting the health of workers to those affecting the public welfare has been misapprehended in that questions involving the hygiene of industries have been treated more or less as separate and accidental branches of sanitary science, constituting a field entirely apart from that of the study of general hygienic conditions. Fortunately, however, the old viewpoint is being rapidly replaced by the concept that, far from constituting a separate field of their own, the hygienic conditions in industries must be considered as forming a part of the general field of public-health work. This is the more evident from the fact that industrial conditions affecting the health of the worker can never be separated sharply from those of his total environment, nor is it possible to define where the field of industrial hygiene ceases and that of public health begins. It inevitably happens that an investigation of a particular zone of sanitary science leads us further and further afield, so that, in following collateral ramifications, we soon find ourselves once more considering broad questions of the public welfare.

When recent legislation increased the functions of the Public Health Service, it became possible to enter more freely into the study of questions of industrial hygiene and enlarge materially the sphere of the service's former activities in this direction. One of the first matters for investigation seemed to be that of the actual condition of health of workers in various industries. Studies of this character are necessary in order properly to assess the value which should be assigned to the influence of insanitary conditions, inherent in the industry under consideration, upon the health of the worker, and the effect of other insanitary conditions common to his social and economic status.

Fortunately, an opportunity was early presented to make the first of a series of such studies which the service hopes to extend as facilities permit. The Surgeon General of the Public Health Service received a request from the Joint Board of Sanitary Control of the Cloak, Suit and Skirt, and Dress and Waist Industries of New York City, to make an investigation of the health of workers in these industries, together with studies as to hygienic conditions of illumination in shops of these trades, and certain studies as to the air of such shops as affected by the use of gas-heated pressing irons. It was, accordingly, decided to make these studies, and the writer was detailed to have general charge of them.

The Joint Board of Sanitary Control of the Cloak, Suit and Skirt, and Dress and Waist Industries.—As the request for these studies was made by the Joint Board of Sanitary Control of the Cloak, Suit and Skirt, and Dress and Shirt Waist Industries of New York City, which cooperated in the work, it may be of interest to describe briefly this board, which constitutes a new departure in the history of industries in the United States. As a result of a strike of garment workers in New York, in 1910, among other industrial differences which were composed, the Joint Board of Sanitary Control was constituted for the purpose of improving and supervising the sanitary conditions in the associated garment trades, i. e., the cloak, suit and skirt, and dress and waist industries. This board consists of representatives of the manufacturers, of the cloak, suit and skirt, and dress and waist maker's unions, and of the general public. Its executive and sanitary activities are conducted under the supervision of a director. Its general duties are as follows:

1. To establish and enforce sanitary standards in the shops of the above-mentioned industries.
2. To reduce, so far as possible, the danger from fire hazards.
3. To see that workers receive proper instruction in fire drills and fire prevention.
4. To educate workers in the principles of industrial and personal hygiene and to stimulate a demand among them for hygienic industrial conditions.
5. To see that complaints received as to insanitary conditions existing in shops of the trade are investigated and the conditions rectified.

Extent of the cloak and suit, and dress and waist industries.—The principal center of the cloak and suit and dress and waist industry in the United States is found in New York City. According to the figures contained in the Third Annual Report of the Joint Board of Sanitary Control, it appears that in 1913 there were 1,735 shops, with 48,967 persons engaged in the cloak, suit, and skirt trades, and 700 shops, employing 36,868 persons, in the dress and shirt-waist industries, or a total of 2,435 shops and 85,835 workers in both industries. In the cloak, suit, and skirt trades about 87 per cent of the workers are males and 13 per cent females, while in the dress and waist industries the proportions are reversed, 77 per cent being females and 23 per cent males.

Scope of the investigation.—The investigation began on April 13, 1914, and the portion described in this report lasted till November 1, 1914. A certain part of the investigation, relating to the effect of gas-heated apparatus upon the air of shops, is still being continued, and the results will be set forth in a subsequent report.

The investigation consisted of the following lines of inquiry:

1. A complete physical examination of about 2,000 male and 1,000 female workers in the industries concerned.

2. Detailed studies of the hygienic conditions of illumination in shops of the two industries.

3. Chemical examination of the composition of the air in shops of the cloak, suit, and skirt and waist industries, particularly as to the presence of carbon monoxide gas.

4. Observations as to conditions of heat and humidity present in the shops of the trade.

5. An inspection as to sanitary conditions of shops.

Through the courtesy of the faculty of Cornell Medical School, the facilities of its chemical laboratory were placed at the disposal of the service for the chemical part of the investigation, while the facilities of the out-patient department were obtained through the kind offices of Prof. W. Gilman Thompson, for the further detailed study of the physical condition of workers or for the medical and surgical relief of any defects or diseases requiring immediate attention found as a result of the examination. Due acknowledgment is hereby made for this assistance. Due acknowledgment is also rendered to the Joint Board of Sanitary Control and its director, Dr. George M. Price, for the cooperation that made this investigation possible.

STUDIES IN OCCUPATIONAL DISEASES.

PART I.

THE HEALTH OF WORKERS WITH SPECIAL REFERENCE TO THE CLOAK, SUIT, AND SKIRT, AND DRESS AND WAIST TRADES IN NEW YORK CITY, N. Y.

By J. W. SCHERESCHEWSKY.

The first part of this report deals with the data derived from the physical examination of garment workers.

Offices were occupied by the service at 31 Union Square, west, for the conduct of these examinations, one set of offices being used for the examination of males, the other for the examination of females. Through the cooperation of the Joint Board of Sanitary Control and the unions of the industries under consideration, information as to the objects of the investigation was disseminated among the workers, so that there were no dearth of applicants for physical examination. The examination of males were conducted by the writer, Passed Asst. Surg. Friench Simpson, Passed Asst. Surg. Robert Olesen, Acting Asst. Surg. William H. Sheldon, and Acting Asst. Surg. H. C. Williamson. The examinations of females, under the supervision of the writer, was conducted by Acting Asst. Surgs. Ebba A. Dederer, Frances Shostac, Eva Cohnheim, and Fanny Dembo. Dr. Barsky of the Joint Board of Sanitary Control also rendered assistance in the examinations, for which due acknowledgment is hereby made.

Type of physical examination.—The type of physical examination made was thorough. An average from 40 to 50 minutes was spent in the examination of each individual. Besides examining conditions of the viscera and the general physical status, observations were made as to the height and weight, circumference of the chest at rest, at full inspiration, at expiration, the abdominal circumference, vital capacity, strength of grip of the right and left hands, pulse rate, the systolic and the diastolic blood pressure, the percentage of hemoglobin in the blood, condition of the reflexes, the teeth, state of the vision, including color sensation, condition of the bodily orifices, conditions of bones, joints, and extremities, the incidence of albumen and sugar in the urine (in males only) and in 259 instances the blood was tested for the presence of syphilitic antibodies.

The physical examination of females was not quite so complete as that of the males.

In addition to the physical data enumerated above, civil and social data were obtained in regard to the following points: Name, age, address, shop, nativity, race, years in the United States, married, single, or widowed, number of children living, number of children dead at time of examination, number of persons in family, health of family, number of rooms in homes, number of bedrooms in home, habits in regard to tea, coffee, alcohol, and tobacco, general occupation, years in general occupation, special occupation, years in special occupation, previous occupation, years in previous occupation, whether piece or week worker, hours of work daily, hours of work weekly, average weekly earnings, average yearly earnings, posture at work, whether standing or sitting. Data were also collected as to the previous state of health and as to any subjective symptoms present at the time of examination.

EXAMINATION OF MALE WORKERS.

In view of the fact that the male workers examined were exclusively engaged in the cloak, suit, and skirt trades, while the females, on the other hand, came almost entirely from the dress and shirt-waist trades, it will be convenient first to consider the data derived from the examination of the males and then those in relation to the females. The male workers examined, as previously stated, consisted of those engaged exclusively in the cloak, suit, and skirt trades, in which some 70 or 80 per cent of the workers are males. For the purposes of classification the workers in this trade may be divided into the following five groups:

(1) Cutters; (2) operators; (3) finishers; (4) pressers; (5) miscellaneous workers (tailors, sample makers, buttonhole makers, bushelmen, and the like).

These perform the following duties: Cutters cut out the garments according to the patterns furnished them; operators sew the pieces together by means of electrically driven sewing machines, each operator making the entire garment so far as this can be accomplished on the machine; finishers perform in general such operations upon garments as must be done by hand, such as overcasting seams, sewing on buttons, and the like; pressers, as their name indicates, press the garments whenever this is required.

Posture at work.—Of the workers above enumerated, two classes (cutters and pressers), habitually work standing, while two, namely, operators and finishers, work sitting. Among miscellaneous workers, whose number is small as compared to the classes just enumerated, there is some variation in the posture, the majority working while sitting, while a few, such as those engaged in draping work, now sitting, now standing.

There are thus important postural differences between the various classes of garment workers. There is also a difference in the wage scale of these workers, two of the groups (operators and finishers) being paid upon a piecework basis, while the two remaining groups (cutters and pressers) are paid by the week.

Number of each class examined.—The following number of each group was examined: Operators, 976; pressers, 720; finishers, 280; tailors, 54; cutters, 48; other miscellaneous workers, 23, or a total of 2,091. It is thus seen that 1,976, or about 95 per cent of those examined, belong to the three principal classes of workers from a numerical standpoint in the cloak, suit, and skirt trade, i. e., operators, finishers, and pressers.

Nativity and race.—The following table (Table 1) gives the race and nativity of the male garment workers examined.

TABLE 1.—*Race and nativity of male garment workers.*

Occupation.	Race.			Nativity.								
	Jewish.	Italian.	Polish.	Russia.	Austria.	Rumania.	England.	Turkey.	America.	Germany.	Italy.	Total.
Operators	971	5	......	832	131	7	......	......	1	......	5	976
Pressers	663	55	4	515	137	11	1	......	1	1	55	722
Finishers	279	3	......	243	28	7	......	1	......	......	3	282
Tailors	53	2	......	41	12	......	......	......	......	......	2	55
Cutters	48	......	......	39	9	......	......	......	......	......	......	48
Miscellaneous	24	......	......	22	2	......	......	......	......	......	......	24
Total	2,038	65	4	1,692	320	25	1	1	2	1	65	2,107
Per cent by race	96.7	3.08	0.19	......	......	......	......	......	......	......	......	......
Per cent of total	......	......	......	80.4	15.2	1.19	0.047	0.047	0.095	0.047	3.09	......

It will be seen from this table that 96.7 per cent of the male workers examined belong to the Jewish, 3.08 per cent to the Italian, and 0.19 per cent to the Polish race. Only two of the number examined were born in the United States, 80.4 per cent being born in Russia, 15.2 per cent in Austria, 3.09 per cent in Italy, 1.19 per cent in Rumania, and 0.047 per cent in Turkey, Germany, and England, respectively.

Length of time in the United States.—The average length of time male garment workers had been in the United States was as follows: Cutters, 8.62 years; operators, 10 years; pressers, 8.35 years; finishers, 8.69 years; tailors, 12.88 years; other miscellaneous workers, 4.64 years. The average length of time in the United States for all male garment workers was 9.25 years in the 2,091 instances in which this information was collected.

Length of time in special occupation.—The workers examined had followed their special occupations for the following average time:

Operators, 9.48 years; pressers, 7.76 years; finishers, 8.5 years; cutters, 6.58 years; tailors, 22.15 years; other miscellaneous workers, 6.42 years. Comparing these figures with those of the average times in the United States for these several occupations, it will be seen, with the exception of the tailors, that apparently male garment workers took up their special occupations shortly after their arrival in the United States.

Previous occupation.—Data referring to previous occupations were collected in the case of 957 operators, 696 pressers, 277 finishers, 46 cutters, 51 tailors, and 23 other miscellaneous workers a total of 2,052 instances. In 478 cases the workers had no previous occupation. Previous occupations were reported in 1,574 instances. The following table gives a list of these occupations:

TABLE 2.—*Previous occupations of male garment workers (2,052 observations).*

Occupation.	Operators.	Pressers.	Finishers.	Cutters.	Tailors.	Miscellaneous.	Total.
No previous occupation	243	146	4	28	50	7	477
Baker		3					3
Barber		1					1
Belt maker	1						1
Blacksmith	2	28					30
Bookbinder	3	2		1			6
Bookkeeper	1	3					4
Brass foundry worker		1					1
Brewery worker		2					2
Bricklayer	1	3					4
Brickmaker		1					1
Bristol-hair worker	1	2					3
Brush maker		1					1
Butcher	5	2				1	8
Buttonhole maker		1					1
Button maker	3						3
Candy maker	1	1					2
Cane maker		1					1
Cap maker	11	1					12
Caretaker		1					1
Carpenter	9	21		1			31
Cement layer		1					1
Chair maker		2					2
Cigar maker	1						1
Cigarette maker		3					3
Clerk	32	38	2	9	1	2	84
Comb maker	1	1					2
Commerce	57	198	1	1		3	260
Cook		1					1
Dancing teacher		1					1
Dock worker		1					1
Dressmaker			1				1
Dyer		1					1
Egg candler	1	1					2
Embalmer		1					1
Embroiderer	4	1		1			6
Errand boy	3						3
Expressman		4					4
Farmer	5	36					41
Fireman		1					1
Furniture-factory worker		1					1
Furrier	6	5					11
Glass factory worker		2					2
Hair worker						1	1
Hat maker	1	1					2
Innkeeper		1					1
Ironworker	3	13					16
Knitter		1					1
Laborer	1	26					27
Ladies' hats	1			1			2
Laundry worker		2					2
Lead worker		1					1
Leather worker	2	17		1			20

TABLE 2.—*Previous occupations of male garment workers (2,052 observations)*—Contd.

Occupation.	Operators.	Pressers.	Finishers.	Cutters.	Tailors.	Miscellaneous.	Total.
Linesman		1					1
Locksmith		1					1
Marble factory worker		1					1
Match worker	2	1					3
Mechanic	2						2
Metal worker		2					2
Miller		2					2
Musician		1					1
Oil factory worker	1						1
Operator men's garments	7	1				1	9
Painter	1	4					5
Pants maker	6	1					7
Paper-box maker	1	3					4
Paper-factory worker	1						1
Pocketbook maker	4						4
Printer	2	1		1			4
Plumber		2					2
Quilt maker	1						1
Railway worker		3					3
Raincoat maker	1						1
Razor-factory worker				1			1
Rubber worker	1						1
Salesman		2					2
Seltzer-water maker		2					2
Shirt maker	2						2
Shirt presser		1					1
Skirt maker	2					1	3
Skirt pleater		1					1
Shoe worker	59	28					87
Soap-factory worker		1					1
Suitcase maker	1						1
Tailor	447	15	269			6	737
Teacher	1	2					3
Teamster		15					15
Tin-factory worker	1	1					2
Tinsmith		1					1
Tire-factory worker		1					1
Wagon maker		2					2
Waiter	2	5					7
Waist maker						1	1
Watchmaker				1			1
Weaver	13	10					23
Wheel maker		1					1
Wood sawyer		1					1
Wood turner	2	1					3
Total	959	696	277	46	51	23	2,052

It will be seen from this table that the pressers exhibited the greatest variety in their previous occupations, having been engaged in 77 previous callings. The operators come next with a list of 48 different trades. The cutters had 10 kinds of previous occupations, the miscellaneous workers 8, the finishers 4, the tailors but 1. Only 1 tailor out of 50 had had any previous occupation. Ninety-nine per cent of the finishers, 70 per cent of the operators, and 50 per cent of the miscellaneous workers had previous occupations directly connected with the clothing trades, while in the case of pressers and cutters having previous occupations, in only 4 per cent and 0.5 per cent, respectively, of the instances were these callings connected with the garment trades. It will be noted that among pressers as a class a number of the previous occupations entailed considerable muscular exertion, and hence required a vigorous physique, no less than 40 or 50 per cent of the previous occupations reported by pressers being of this character. In the case of the operators 14 previous occupations reported, or 29 per cent, called for vigorous muscular exertion, while in the case of the finishers all the previous occupations reported were of a sedentary character.

Civil condition of male garment workers.—In regard to this condition the following percentages (Table 3) of male garment workers were, respectively, single and married:

TABLE 3.—*Civil condition of male garment workers (per cent single and married).*

	Married.	Single.
	Per cent.	*Per cent.*
Operators	66.5	33.5
Pressers	83.28	16.72
Finishers	81.00	19.00
Cutters	29.00	71.00
Tailors	85.19	14.1
Other miscellaneous workers	74.00	26.00

Children born to married garment workers.—The total number of children born to 1,518 married garment workers was 4,878, of whom 4,096 were living and 882 were dead at the time of the examination. The percentage of the children who died of the total number born was therefore 15.82.

The average number of children born to each married garment worker was 3.21, while the average number of children living at the time of examination to each married garment worker was 2.7, leaving an average of 0.51 children dead prior to the time of the examination. Analyzing by groups, the births and mortality of children among married garment workers, the following results were noted:

Married operators (639): Average number of living children to each married operator, 2.39; of children dead, 0.31; of total children born, 2.70.

Married pressers (578): Average number of living children to each married presser, 2.83; of children dead, 0.58; average total number of children born, 3.41.

Married finishers (225): Average number of living children to each married finisher, 3.70; average number of children dead, 0.93; average total number of children born, 4.63.

Married tailors (46): Average number of children living, 2.83; of children dead, 0.57; of total children born, 3.4.

Married cutters (14): Average number of living children to each married cutter, 0.71; number of children dead, 0.21; total number of children born per cutter, 0.92.

Married miscellaneous workers (16): Average number of living children to each miscellaneous married worker, 2.5; average number of children dead, 0.19; average total number of children born, 2.69.

The percentage of children dying of the total number born, prior to the time of the examination, was as follows for these groups:

Operators, 11.7 per cent; pressers, 17.11 per cent; finishers, 21.7 per cent; cutters, 23 per cent; tailors, 16.6 per cent; other miscellaneous workers, 7 per cent. It is thus seen that the group having the highest number of children, namely, the finishers, had also the greatest mortality among the children born to them, with the exception of the cutters, in which group the number of observations is too small to permit of drawing conclusions.

Income of garment workers.—In collecting information as to the amounts earned by garment workers, reliance had to be placed upon their individual statements. These statements furnish the results set forth in the following table:

TABLE 4.—*Average annual earnings of male garment workers.*

Occupation.	Annual earnings.	Occupation.	Annual earnings.
Miscellaneous workers	$893	Operators	$666
Tailors	748	Pressers	562
Cutters	720	Finishers	486

From this table it is seen that the miscellaneous workers had the highest earning capacity followed, in order named, by cutters, operators, pressers, and lastly the finishers. The high wages earned by the miscellaneous workers is due to the fact that this group contained a large proportion of specially qualified workers of whom some earned wages to the amount of $1,500 annually. It will be noted, with the exception of the cutters, that the mortality among the children born to married garment workers apparently bears a general relation to the annual earnings in that the group earning the highest wages—i. e., miscellaneous workers—had the lowest mortality among their children, whereas the finishers with the lowest annual income had the highest mortality.

The average annual earnings of all the male garment workers examined, as reported by them, were $611.50. The annual income of garment workers, however, is not in direct proportion to their weekly wages for the reason that employment is not continuous throughout the year in this industry. This occupation presents a marked seasonal fluctuation, as there are periods of great activity in production in the busy fall and spring seasons, while during the summer and the middle of the winter, there is relatively little work to be had.

Number of persons in families of male garment workers.—It was deemed of interest to ascertain, in connection with the wages earned, the number of persons in the families of male garment workers.

Accordingly, data on this point were collected. The following table shows the number of persons in the families of male garment workers:

TABLE 5.—*Number of persons in families of male garment workers.*

	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous.	All male workers.
Number of observations	959	683	278	54	48	24	2,046
Number in families	5,070	3,714	1,538	294	187	121	10,969
Average in family	5.28	5.54	5.53	5.44	5.5	5.04	5.35

From this table it appears that the average number of persons in the families of male garment workers was about the same for each class, and that the average number of persons in the families of male garment workers was 5.35.

Number of rooms in domiciles of male garment workers.—Turning now to the number of rooms in the domiciles of male garment workers, the following table gives the data concerning this point in 2,048 instances:

TABLE 6.—*Number of rooms in domiciles of male garment workers.*

Number of rooms in domicile.	Operators.	Pressers.	Finishers.	Cutters.	Tailors.	Miscellaneous workers.	Total.	Per cent.
1 room	1	1					2	0.98
2 rooms	16	35	13	1			65	3.17
3 rooms	259	228	93	6	12	8	606	29.8
4 rooms	480	307	124	28	28	11	978	47.7
5 rooms	154	84	37	9	8	2	294	14.35
6 rooms	43	21	10	3	5	2	84	4.1
7 rooms	6		2				8	.39
8 rooms	1	6					7	.34
9 rooms	1						1	.49
10 rooms								
11 rooms	1						1	.49
Sleep in shops		2					2	.98
Total	962	684	279	47	53	23	2,048	
Average number of rooms in domicile	3.98	3.77	3.8	4.15	4.11	3.48	3.88	

From this table it is seen that the average number of rooms in the domiciles of all male garment workers was 3.88. The pressers, with an average of 3.77 rooms, had the lowest average, while the cutters, with 4.15, had the highest. In 47.7 per cent of the instances the number of rooms in the domiciles of male garment workers was 4, and in nearly 30 per cent of the cases there were but 3. Dividing the average number (5.35) in the families of male garment workers by the average number of rooms in their domiciles (3.88), it will be seen that the average number of occupants per room is 1.37.

Considering now the number of rooms stated to be used as bedrooms in the domiciles of male garment workers, the results set forth in the following table were noted:

TABLE 7.—*Number of bedrooms.*

	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous workers.	General average.
Number of observations	959	684	280	54	48	24	2,049
Total number of bedrooms	1,548	1,061	436	83	67	36	3,231
Average number of bedrooms	1.614	1.552	1.557	1.53	1.445	1.5	1.576

It will be seen from this table that operators with an average number of rooms, used exclusively as bedrooms, of 1.614 in their domiciles had the highest average, while cutters, with 1.445, had the lowest. The pressers, who had the highest average number of persons in their families (5.54) had the lowest number of rooms used exclusively as bedrooms.

Hours of labor.—Since the strike in the garment trades in New York, in 1910, the daily hours of labor in the garment trades has been fixed at 50 hours per week, namely, 9 hours daily, except on Saturday, which is a half day. Overtime is allowed in the busy fall and spring season, but it appears from the Third Annual Report of the Joint Board of Sanitary Control that the necessity for working overtime has been greatly reduced.

HABITS OF MALE GARMENT WORKERS IN REGARD TO THE USE OF TEA, COFFEE, ALCOHOL, AND TOBACCO.

Use of tea and coffee.—Observations were made as to the use of tea and coffee among male garment workers in 1,961 instances. The following table shows the number of non-users of either beverage, the number of habitual users, and the number of occasional users of coffee and tea:

TABLE 8.—*Use of coffee and tea among male garment workers.*

Occupation.	Non-users of coffee or tea.	Per cent.	Number using coffee or tea habitually.	Per cent.	Number using coffee or tea occasionally.	Per cent.	Total number using coffee or tea occasionally or habitually.	Per cent.	Total number of observations.
Operators	141	15.4	403	44.0	372	40.5	775	84.6	916
Pressers	81	12.5	368	56.7	200	30.8	568	87.5	649
Finishers	32	11.5	156	56.4	89	32.1	245	88.5	277
Tailors	9	17.6	18	35.3	24	47.1	42	82.4	51
Cutters	7	14.9	27	57.4	13	27.6	40	85.1	47
Miscellaneous workers	3	14.3	11	52.4	7	33.0	18	85.7	21
Total	273	13.9	983	50.1	705	35.9	1,688	86.1	1,961

From this table it appears that 273, or 13.9 per cent of workers in regard to whom this information was collected, used neither tea nor coffee, while 1,688, or 86.1 per cent, used coffee or tea habitually or occasionally. Of this number 983 used either or both of these beverages habitually, and 705 used them occasionally. An individual was said to be an habitual user when the beverage in question was used daily.

Although there was but little difference among the various groups of workers as to their habits in regard to tea and coffee, finishers were inclined to use these beverages the most freely and tailors the least freely among garment workers. The number of observations, however, in this latter group was low, and several of their number after having been free users of these beverages in the past had recently discontinued their use on the advice of physicians.

Use of alcohol among garment workers.—As a class male garment workers were found moderate in their use of alcohol. Very few of those examined gave indications of the immoderate use of alcohol in the past.

The following table shows the number of total abstainers, the number of occasional, and the number of habitual users of alcohol in 1,976 male garment workers in whose case these data were recorded:

TABLE 9.—*Use of alcohol, male garment workers.*

Occupation.	Total abstainers.	Per cent.	Occasional users of alcohol.	Per cent.	Habitual users of alcohol.	Per cent.	Total.
Operators	297	32.0	483	52.0	148	16.0	928
Pressers	132	20.3	347	53.5	170	26.2	649
Finishers	86	30.9	144	51.8	48	17.3	278
Cutters	24	51.0	20	42.5	3	6.4	47
Tailors	19	35.2	26	48.2	9	16.6	54
Miscellaneous workers	6	30.0	10	50.0	4	20.0	20
Total	564	28.5	1,030	52.1	382	19.3	1,976

From this table it appears that 564, or 28.5 per cent of male garment workers included in the table, were total abstainers; 1,030, or 52.1 per cent, made occasional use, and 382, or 19.3 per cent, made habitual use of alcoholic beverages. "Habitual use" has the same meaning as applied to the use of alcoholic beverages as it has to the use of coffee and tea, i. e., it implies daily use. Cutters, as a class, showed the greatest number of total abstainers (51 per cent), pressers the least (29.3 per cent); cutters also showed the least number of habitual users of alcohol (6.4 per cent), while pressers also showed the highest number (26.2 per cent). It is possible that the work of the presser, requiring as it does considerable muscular exertion, besides exposure to the added heat of pressing irons, and the humidity generated from damp pressing cloths, is a factor in determining the greater addiction of pressers to alcoholic beverages.

Among the habitual users of alcoholic beverages the relative number of habitual drinkers of beer only (120) was very nearly equal to the number (129) of drinkers of beer and whisky. The number of habitual users of beer only and of beer with whisky occasionally was 165, as compared to 97 who use whisky habitually and whisky with beer occasionally. The average daily consumption of those habitually using beer alone was 3.07 glasses per day; of those using whisky alone, 1.4 drinks per day. Naturally the habitual users of both beer and whisky showed the greatest daily consumption of alcoholic beverages, the amount used daily being 3.06 glasses of beer and 1.44 drinks of whisky for each habitual user of both beverages.

Use of tobacco among male garment workers.—Observations as to the use of tobacco were collected in 2,072 instances. The following table shows the number of male garment workers who were, respectively, nonsmokers, occasional smokers, and habitual smokers:

TABLE 10.—*Use of tobacco, male garment workers.*

Occupation.	Nonsmokers.	Per cent.	Occasional smokers.	Per cent.	Habitual smokers.	Per cent.	Total.
Operators	523	53.8	35	3.6	414	42.6	972
Pressers	295	42.5	17	2.45	382	55.1	694
Finishers	173	61.7	3	1.07	104	37.4	280
Cutters	29	60.4	....	....	19	39.6	48
Tailors	34	63.0	1	1.8	19	37.0	54
Miscellaneous workers	14	58.4	....	....	10	41.6	24
Total	1,068	52.5	56	2.7	948	45.8	2,072

It will be seen from the above table that of 2,072 male garment workers, 1,068, or 51.5 per cent, were nonsmokers; and 948, or 45.8 per cent, were habitual smokers. It is seen that the habit of smoking is not unusually prevalent among male garment workers, the number of nonsmokers exceeding the number of those smoking.

Examining now the form of smoking used by the habitual smokers among male garment workers, the following table gives the number and percentages of the habitual smokers smoking cigarettes, cigars, pipes, and pipes and cigarettes together, respectively:

TABLE 11.—*Form of smoking used by habitual smokers, male garment workers..*

Occupation.	Cigarette smokers.	Per cent.	Cigar smokers.	Per cent.	Pipe smokers.	Per cent.	Cigarette and pipe smokers.	Per cent.	Total number habitual smokers.
Operators	390	94.0	15	3.86	9	2.2	....	....	414
Pressers	361	94.57	9	2.38	8	2.07	4	1.05	382
Finishers	98	94.2	5	4.8	1	.96	....	....	104
Cutters	18	94.8	1	5.2	....	....	....	....	19
Tailors	19	100.0	....	....	....	....	....	....	19
Miscellaneous workers	10	100.0	....	....	....	....	....	....	10
Total	896	94.6	30	3.14	18	1.9	4	.42	948

From this table it is seen that 896 of the 948 habitual smokers, or 94.6 per cent, smoked cigarettes; 30, or 3.14 per cent, smoked cigars; 18, or 1.9 per cent, smoked pipes, while 4, or 0.42 per cent, smoked both pipes and cigarettes. The average daily consumption of the 896 cigarette smokers was 9,231 cigarettes, or an average of 10.3 cigarettes to each person, per diem. Thirty cigar smokers smoked 88 cigars per diem, or an average of 2.66 cigars daily to each person, while 22 workers using pipes smoked 186 pipefuls a day, or an average of 8.5 pipefuls daily. It is seen that cigarette smoking is by far the most popular form of tobacco addiction among male garment workers. The kind of cigarettes most preferred by these workers were Turkish cigarettes. Several instances of irregular and intermittent action of the heart, bradycardia, tachycardia, and a number of cases of chronic pharyngitis and laryngitis, thought to be due to excessive smoking, were observed among male garment workers.

PHYSICAL DATA.

Age of male garment workers.—The average age of all male garment workers examined was 32.26 years. The average age, by groups, was as follows: Cutters, 25.36 years; operators, 29.53 years; pressers, 34.59 years; finishers, 35.6 years; tailors, 36.5 years; other miscellaneous workers, 31.77 years.

The following table shows the distribution of ages by five-year periods and the percentage of each period in the various groups of male garment workers:

TABLE 12.—*Age distribution of male garment workers.*

Ages.	Age distribution of garment workers.							Per cent of each age group.						
	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous.	Total.	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous.	All workers.
18–19	15	9	9	1	2	2	38	1.53	1.254	3.23	1.85	4.17	8.34	1.82
20–24	228	83	42	2	22	5	382	23.8	11.6	15.00	3.70	45.8	20.8	18.3
25–29	309	140	46	6	16	5	522	31.95	19.5	16.5	11.1	33.3	20.8	25.00
30–34	225	150	47	11	6	8	447	23.24	20.43	16.8	20.4	12.5	3.33	21.4
35–39	107	132	43	17	2	2	303	11.8	18.35	15.4	31.4	4.17	8.34	14.5
40–44	54	112	33	7	......	1	207	5.85	15.6	11.8	12.95	......	4.17	9.9
45–49	16	51	19	5	......	1	92	1.66	7.1	6.9	9.26	......	4.17	4.4
50–54	7	29	21	2	......	......	59	.725	4.04	7.54	3.70	......	......	2.82
55–59	5	8	12	3	......	......	28	.517	1.1	4.3	5.55	......	......	1.34
60–64	1	3	4	......	......	......	8	.14	.42	1.43	......	......	......	.382
65–69	......	2	2	......	......	......	4	......	.28	.72	......	......	......	.191
70–74	......	......	1	......	......	......	1	......	......	.36	......	......	......	.047
Total number	967	719	279	54	48	24	2,091							
Average ages	29.53	34.59	35.6	36.5	25.56	31.77	32.26							

It will be seen from this table that the maximum age incidence in the various groups fell as follows: Operators, between 25 and 29 years; pressers, between 30 and 34 years; cutters, between 20 and 24 years;

tailors, between 35 and 39 years, while in finishers the age incidence was nearly equal for the age periods from 20 to 24, 25 to 29, 30 to 34, and 35 to 39. In miscellaneous workers the age incidence was equal for the periods 20 to 24 and 25 to 29.

Taken together, it will be seen that 79 per cent were between 20 and 34 years of age and over 90 per cent were between 20 and 40 years.

Height.—For various reasons it was not found expedient in the case of male garment workers to measure their heights otherwise than in their shoes. The heights of male garment workers given in this report are therefore about seven-eighths of an inch in excess of their actual heights. The average height of all male garment workers examined was found to be 65.46 inches.

In the groups the following average heights were found:

TABLE 13.—*Average heights of workers.*

	Number.	Average height.
		Inches.
Pressers	717	65.82
Miscellaneous workers	24	65.81
Cutters	48	65.73
Operators	964	65.35
Tailors	54	65.19
Finishers	280	64.69

The following table gives the distribution of heights observed:

TABLE 14.—*Distribution of heights among male garment workers.*

Height between—	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous workers.	Total.
57 and 58 inches		1					1
58 and 59 inches			1				1
59 and 60 inches	1	1	3				5
60 and 61 inches	16	3	9				28
61 and 62 inches	35	14	17		1		70
62 and 63 inches	77	47	28	4	2	1	159
63 and 64 inches	130	73	45	10	4	4	266
64 and 65 inches	153	105	55	9	13	3	338
65 and 66 inches	182	141	39	6	5	8	381
66 and 67 inches	154	124	40	11	11	3	343
67 and 68 inches	103	92	25	5	5	2	232
68 and 69 inches	58	53	13	3	2	2	131
69 and 70 inches	39	35	5	1	3	1	84
70 and 71 inches	7	21		1	1		30
71 and 72 inches	8	6		1			15
72 and 73 inches	1	1			1		3
Total	964	717	280	54	48	24	2,087

It will be seen from this table that the maximum incidence of height fell between 65 and 66 inches. In 1,328 instances, or in over 62 per cent, the height fell between 63 and 68 inches, and in 75 per cent of the instances the height was between 63 and 68 inches. The maximum height noted was in a cutter 72.5 inches tall, while the minimum was in a presser who was 57.5 inches in height.

In considering the average heights of the various groups of garment workers, it will be seen that the pressers are the tallest, followed in order by the miscellaneous workers, cutters, operators, tailors, and, lastly, the finishers. The difference between the average height of the finishers and that of the tallest of the groups, namely, the pressers, is 1.13 inches.

Average weights of male garment workers.—It was also found impracticable to weigh the workers naked. All weights were taken with the individual clad in his shoes and trousers, the body being stripped from the waist up. The weights so obtained were, on an average, about 3½ pounds in excess of the actual weight. The average weight of all male garment workers was found to be 141.21 pounds. The average weight of the several groups of male garment workers was as follows:

TABLE 15.—*Average weight by groups.*

	Number.	Average weight.
		Pounds.
Tailors	54	147.81
Pressers	717	146.43
Miscellaneous workers	24	143.49
Operators	964	138.70
Finishers	279	136.48
Cutters	48	135.99

It will be seen that the finishers manifest an inferiority in weight, as they do in height, to both operators and pressers. Although the cutters are the lightest of the groups, their low average age, and their standing position, together with the nature of their work, which does not require much muscular work, tends to account for their lighter weight. In the groups represented by large numbers the pressers manifest a decided superiority in weight, as they do in height. In this group we find a class of workers engaged in an occupation entailing considerable muscular exertion in the manipulation of the heavy pressing iron, together with the muscular effort required by their continuous maintenance of the standing posture.

Relation of height and weight.—Turning now to the relation of height to weight, the following table shows the average weights of male garment workers for each height:

TABLE 16.—*Average weights of male garment workers for each height.*

Height between—	Number of observations.	Average weight (pounds).
57 and 58 inches	1	142.75
58 and 59 inches	1	115.00
59 and 60 inches	5	118.75
60 and 61 inches	28	117.70
61 and 62 inches	70	126.23
62 and 63 inches	159	131.11
63 and 64 inches	266	134.00
64 and 65 inches	338	137.25
65 and 66 inches	381	141.27
66 and 67 inches	343	143.68
67 and 68 inches	232	148.73
68 and 69 inches	131	153.17
69 and 70 inches	84	156.00
70 and 71 inches	30	167.35
71 and 72 inches	15	161.70
72 and 73 inches	3	151.50
Total	2,087	....

Excluding the two upper and the three lower heights in which the number of observations was too small on which to base averages, this table shows a fair correlation of weight to height. It was found that the average increment of weight for each inch of height was 4.97 pounds for heights between 61 and 71 inches.

Circumference of chest of male garment workers.—Three measurements were taken of each chest at the nipple line: At rest; at full inspiration; at forced expiration.

The following table gives the average circumference as found:

TABLE 17.—*Average chest circumference of male garment workers.*

Occupation.	Number.	Chest passive.	At inspiration.	At expiration.	Expansion.
Operators	967	34.90	36.21	34.40	1.81
Pressers	710	36.00	37.24	35.60	1.64
Finishers	278	34.61	36.00	34.37	1.63
Cutters	48	34.17	35.72	33.86	1.86
Tailors	54	36.20	37.30	35.59	1.79
Miscellaneous	23	35.17	36.56	34.80	1.76
General average	2,080	35.27	36.57	34.82	1.75

It will be seen from the above table that the tailors[1] have the largest chests, followed in order by pressers, miscellaneous workers, operators, finishers, and cutters.

The average chest expansion was 1.75 inches. The highest chest expansion was found in the cutters, and next to these, the operators, while the lowest was found among the finishers. The higher average chest expansion of the cutters and operators is doubtless due to the low average ages in these groups which would be accompanied by a greater mobility of the thoracic walls.

Turning now to the relation of the circumference of the chest to the height of the individual, the following table shows the number of instances among male garment workers in which the circumference of the chest, at rest, was less than one-half the height of the individual:

TABLE 18.—*Number of male garment workers with circumference of chest (at rest) less than one-half the height.*

Occupation.	Total number.	Number with chest measure less than one-half the height.	Per cent.
Operators	972	156	16.1
Finishers	280	40	14.35
Pressers	694	54	7.65
Cutters	48	11	22.9
Tailors	53	3	5.65
Miscellaneous	23	5	21.6
Total	2,070	269	13.0

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[1] Pressers must be regarded as actually superior to tailors in chest circumference, as a number of the small group of tailors were obese.

From this table it will be seen that in about 13 per cent of the cases the circumference of the chest, at rest, was less than one-half the height. Considering the workers by groups, we find that in 22.9 per cent of the cutters, 21.6 per cent of the miscellaneous workers, 16.1 per cent of operators, 14.35 per cent of finishers, 7.65 per cent of pressers, and in 5.65 per cent of tailors, this measurement was less than one-half the height. The relation of the circumference of the chest to height is of interest in that it is the general practice to reject recruits for military service who have a chest circumference of less than one-half the height.

Vital capacity.—The vital capacity of male garment workers was measured by means of a dry spirometer. In order to avoid the transmission of communicable diseases by means of the mouthpiece, a large number of glass mouthpieces were prepared, a sepamouthpiece being used for each individual. After use, each mouthpiece was sterilized by boiling before being used again.

The following table shows the average vital capacity of male garment workers in 1,787 instances in which this observation was made:

TABLE 19.—*Vital capacity of male garment workers.*

	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous.	Total.
Total number of observations	857	563	256	48	43	20	1,787
Total vital capacity........cubic inches..	195,873	129,430	52,635	10,065	10,240	4,415	402,658
Average vital capacity..............do....	230.1	227.9	204.8	209.5	238.2	220.75	225.29
Maximum vital capacity...........do....	330	340	330	310	330	260	....
Minimum vital capacity...........do....	70	50	80	80	150	170	....

It will be seen from this table that the average vital capacity was 225.3 cubic inches. Cutters with 238.2 cubic inches had the highest average vital capacity, followed in order by operators with 230.1 cubic inches, pressers 227.9 cubic inches, miscellaneous workers 220.75 cubic inches, tailors with 209.5 cubic inches, and, lastly, the finishers with 204.8 cubic inches. It will be seen from the above that finishers are again inferior to the other groups of garment workers. It is worth noting that pressers, though superior to operators in weight, height, and average circumference of chest, are their inferiors in both chest expansion and vital capacity. The youngest group of workers, namely, cutters, showed the greatest average expansion and greatest vital capacity. The operators, next in point of age, showed the second highest chest expansion and vital capacity. The greater average age of pressers and the consequent diminution in the mobility of the ribs is, in all likelihood, the cause of their lesser vital capacity, in spite of the superiority of their physique, as compared to the younger groups (operators and cutters). The maximum observation of vital capacity, however, namely 340 cubic inches, occurred in a presser.

Relation of vital capacity to height.—The following table gives the average vital capacity in relation to various heights of male garment workers:

TABLE 20.—*Vital capacity of male garment workers as compared to height.*

Height.	Operators.		Pressers.		Finishers.		Tailors.	
	Number.	Average vital capacity.	Number.	Average vital capacity.	Number.	Average vital capacity.	Number.	Average vital capacity.
57 to 58 inches			1	330.0				
58 to 59 inches					1	180.0		
59 to 60 inches	1	150.0	1	100.0	3	173.3		
60 to 61 inches	15	186.0	2	195.0	8	175.0		
61 to 62 inches	32	187.7	11	197.3	16	178.4	3	220.0
62 to 63 inches	67	208.1	36	186.1	26	186.2	4	202.5
63 to 64 inches	112	216.1	63	203.9	39	188.2	10	190.0
64 to 65 inches	136	227.4	85	218.2	52	203.3	6	215.0
65 to 66 inches	161	229.4	113	226.4	32	213.2	6	166.6
66 to 67 inches	138	240.9	99	235.0	38	233.4	9	237.2
67 to 68 inches	88	244.7	61	241.1	22	218.6	5	222.0
68 to 69 inches	53	250.4	41	262.1	13	241.6	3	216.7
69 to 70 inches	35	267.4	27	256.5	5	220.0	1	220.0
70 to 71 inches	6	276.7	16	273.8				
71 to 72 inches	7	249.3	5	293.0			1	180.0
72 to 73 inches	1	280.0	1	270.0				
Total	852	230.4	562	229.6	255	205.6	48	207.4

Height.	Cutters.		Miscellaneous.		All male garment workers.		
	Number.	Average vital capacity.	Number.	Average vital capacity.	Number.	Average vital capacity.	Per cent.
57 to 58 inches					1	330.0	0.0562
58 to 59 inches					1	180.0	.0562
59 to 60 inches					5	154.0	.2810
60 to 61 inches					25	183.6	1.4050
61 to 62 inches	1	250.0			63	189.5	3.5410
62 to 63 inches	2	185.0	1	210.0	136	197.6	7.6500
63 to 64 inches	2	220.0	4	196.2	230	209.2	12.9300
64 to 65 inches	11	231.8	8	221.7	293	220.3	16.4950
65 to 66 inches	5	246.0	6	236.6	323	226.0	18.1750
66 to 67 inches	11	236.4	2	230.0	297	237.6	16.7000
67 to 68 inches	4	240.0	2	250.0	182	240.8	10.2250
68 to 69 inches	2	295.0	2	187.5	114	252.4	6.4150
69 to 70 inches	3	270.0			71	259.4	3.9900
70 to 71 inches	1	260.0			23	273.9	1.2920
71 to 72 inches					13	260.8	.7310
72 to 73 inches					2	275.0	.1130
Total	42	239.5	20	322.5	1,779	226.1	100.055

It will be seen from this table that, with the exception of the extreme upper and lower groups, which contain very few observations, that the mean vital capacity increases between the heights of 59–60 and 70–71 inches, the average increment for each added inch of height being 11.8 cubic inches.

Abdominal circumference.—The abdominal circumference was taken at the umbilicus. The average abdominal circumference of 2,046 male garment workers was found to be 32.42 inches.

The following table gives the average abdominal circumference observed in the various groups:

TABLE 21.—*Abdominal circumference of male garment workers.*

	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous.
Number of observations	955	690	277	54	48	22
Total circumference in inches	30,720.90	22,716.37	9,022.25	1,848.75	1,463.75	725.00
Average in inches	32.18	32.98	32.56	34.20	30.50	32.92

Total number of workers	2,046
Total abdominal circumference in inches	66,497.02
Average abdominal circumference in inches	32.42

It will be seen that the cutters, by reason of their youth, showed the lowest average abdominal circumference of 30.5 inches. Then followed, in order, operators with an average of 32.18 inches, finishers with 32.56 inches, miscellaneous workers with 32.92 inches, pressers with 32.98 inches, and, lastly, tailors with 34.20 inches.

We see in the case of the tailors the effect of a sedentary occupation combined with age in increasing the average girth of the abdomen.

The difference between the average abdominal and average chest circumferences of male garment workers was 2.85 inches. The excess of chest girth over average abdominal circumference was 3.67 inches for cutters, 3.02 inches for pressers, 2.25 inches for miscellaneous workers, 2.05 inches for finishers, and 2 inches for tailors.

It is probable in the case of cutters and pressers that their work in the standing posture, discouraging as this does the accumulation of abdominal fat, has an influence, in these two groups of workers, in determining their lesser abdominal circumference, as compared to that of the chest.

Strength of grip.—The average strength of grip of male garment workers was found to be 33.6 kgs. for the right hand and 31 kgs. for the left. Cutters had the highest right-hand grips, with an average of 36 kgs. in the right hand, and 32.5 kgs. in the left hand. This is probably due to the development of the hand and forearm muscles produced by the constant and accurate guiding of the rather heavy, vibrating, electrically driven cutting machines.

Pressers came next with right and left hand average grips of 34.6 and 32.5 kgs.; operators with 33.5 and 31 kgs.; tailors with 31.1 and 26.5 kgs.; and lastly, the finishers, with 29.2 and 26 kgs., respectively. The maximum right-hand grip observed was 65 kgs. in an operator, the maximum left being 61 kgs. in a presser.

The minimum right and left hand grips were 7 kgs. and 5 kgs., respectively, both observed in operators. The finishers manifested the same inferiority in strength of grips as they showed in other measurements.

Evidences of protection against smallpox.—The male garment workers, as a class, showed a high degree of protection against smallpox by vaccination. In 2,065 garment workers in whom this observation was made 103, or very nearly 5 per cent, showed no evidence of previous successful vaccination. In 1,905 workers, or 92.1 per cent, good vaccination scars were present, while 60 individuals, or 2.9 per cent, had been protected by a previous attack of smallpox.

Pulse rate, blood pressure, and percentage of hemoglobin.—The average pulse frequency observed among male garment workers was 76.8 beats to the minute, with the following averages for the several groups: Finishers, 76.12; operators, 76.22; miscellaneous workers (including tailors), 76.5; pressers, 77.96; cutters, 78.1.

The pulse was counted with the subject at rest in the sitting posture, several observations being made in order to minimize, so far as possible, the effects of excitement due to the examination upon the pulse rate.

The following table gives the distribution of the pulse-rate frequency among male garment workers:

TABLE 22.—*Distribution of pulse frequency. Male garment workers.*

Pulse frequency.	Operators.	Pressers.	Finishers.	Cutters.	Miscellaneous workers.	All male garment workers.
30 to 39	1	1				2
40 to 49	6	1	1			8
50 to 59	29	28	9	1	3	70
60 to 69	218	142	71	13	19	463
70 to 79	335	224	92	12	26	689
80 to 89	246	154	60	11	15	486
90 to 99	90	95	31	6	12	234
100 to 109	32	30	11	4	1	78
110 to 119	4	8	4	1	1	18
120 to 129	1	3	1			5
130 to 140		3				3
Total	962	689	280	48	77	2,056

It will be seen from this table that in very nearly 80 per cent of the observations the pulse rate lay between 60 and 89. Two rather marked cases of bradycardia were observed, the pulse rates lying between 30 and 39, while in three cases the pulse rate lay between 130 and 140.

Blood pressure.—Measurements of systolic blood pressure were taken in 2,066 instances and that of the diastolic blood pressure in 2,051 instances, among male garment workers. The auscultatory method was used, the subject being at rest in a sitting posture.

The following table gives the distribution of the blood pressure observed in 10-millimeter intervals, and the mean systolic and diastolic pressures recorded in the various groups.

TABLE 23.—*Summary of blood pressure of male garment workers.*

DISTRIBUTION OF SYSTOLIC BLOOD PRESSURES.

Millimeters of mercury.	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous.	Total.	Per cent.
80 to 89	2	3	2				7	0.338
90 to 99	20	9	7	1	1	1	39	1.89
100 to 109	72	32	26	4	4	1	139	6.77
110 to 119	251	139	73	13	11	10	497	24.0
120 to 129	311	197	64	16	20	5	613	29.85
130 to 139	182	164	60	7	6	7	426	20.6
140 to 149	80	73	21	1	5		180	8.7
150 to 159	24	46	8	7			85	4.1
160 to 169	13	23	8	2			46	2.23
170 to 179	1	13	3	1			18	.87
180 to 189	1	4	2	2			9	.44
190 to 199	0	2	1				3	.15
200 to 209	1	1					2	.1
210 to 219								
220 to 229								
230 to 239								
240 to 249								
250 to 259		1					1	.05
260 to 269		1					1	.05
Total	958	708	275	54	47	24	2,066	
Average, millimeters	123.39	129.25	125.0	128.0	122.3	119.5	125.65	

DISTRIBUTION OF DIASTOLIC BLOOD PRESSURES.

Millimeters of mercury.	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous.	Total.	Per cent.
40 to 49		1	1				2	0.1
50 to 59	13	8	3				24	1.17
60 to 69	83	50	24		4		161	7.85
70 to 79	233	151	71	11	11	12	489	23.9
80 to 89	316	217	70	16	19	10	648	31.6
90 to 99	212	157	61	13	10	1	454	22.2
100 to 109	70	73	28	8	3	1	183	8.92
110 to 119	20	26	12	2	1		61	2.98
120 to 129	5	9	3	3			20	.98
130 to 139	1	3	1	1			6	.29
140 to 149		2					2	.098
150 to 159								
160 to 169	1						1	.049
Total	954	697	274	54	48	24	2,051	
Average, millimeters	83.84	85.12	84.66	90.6	84.0	80.6	84.53	

It will be seen from this table that the average systolic blood pressure of 2,066 male garment workers was 125.66 millimeters. The average diastolic blood pressure of 2,051 workers was 84.53 millimeters. The average pulse pressure observed therefore was 41.12 millimeters. This falls within the limits of the normal pulse pressure usually given as between 30 and 50 millimeters. Pressers had the highest systolic blood pressure of 129.25 millimeters. Then followed in order tailors with 128 millimeters, finishers with 125 millimeters, operators with 123.39 millimeters, cutters with 122 millimeters, and other miscellaneous workers with 119.5 millimeters.

The highest systolic blood pressure noted was 262 millimeters in a presser. Taking 150 millimeters as a point usually regarded, when reached, as significant of pathological hypertension, there were 165 systolic blood pressures observed of 150 millimeters or over. Among pressers, 91 blood pressures, or 12.85 per cent of the observations reached or exceeded this pressure; among operators, 40, or 4.2 per cent; among finishers, 22, or 8 per cent; among tailors, 12, or 22.2 per cent; while no systolic blood pressures of 150 millimeters or more was observed among the remaining groups.

It is probable that the greater average age of the tailors and the frequency with which pressers had previously engaged in occupations demanding muscular exertion, together with the fact that the occupation of pressers in itself calls for the expenditure of considerable muscular energy, account for the excess of high blood pressures in these two groups.

Hemoglobin.—In view of the necessity for using some rapid method in determining the percentage of hemoglobin present, the Tallquist scale was used. The scales employed were calibrated by comparing readings made by them against readings by two other forms of hemoglobinometer (Dare's and Gower's). The Tallquist scales were found on the average to give readings between 8 and 10 per cent lower than these instruments for hemoglobin values frequently encountered, namely, between 80 and 100 per cent. About 8 or 10 per cent should, therefore, be added to the percentages given herewith.

Computed by the Tallquist scale, the average percentage of hemoglobin of 1,998 male garment workers in whom this was estimated was 86.79 per cent. The minimum reading noted was 65 per cent. In 101 instances hemoglobin percentages of below 80 were observed.

According to groups, the small group of miscellaneous workers with 88.5 per cent had the highest average percentage of hemoglobin. Pressers were next, with an average of 87 per cent, followed in order by operators with 86.8 per cent, cutters with 86.7 per cent, tailors with 86.2 per cent, and finishers with 86 per cent. Although pressers had the highest average percentage of hemoglobin of the three large groups of workers, this group, nevertheless, furnished the worker in whom the lowest reading (65 per cent) found among males was recorded, and also had the greatest number of individuals (31 in 658 observations, or 4.7 per cent) in whom the hemoglobin was below 80, according to the Tallquist scale. This suggests the possibility pointed out by Rogers and others that there may be some relation between a greater frequency of low hemoglobin among pressers and their exposure to chronic carbon monoxide poisoning from gas-heated pressing irons. This point is still being investigated by the Public Health Service.

Development and nutrition.—While the personal equation of the examiner is undoubtedly a factor in the classification of an individual as to the state of his development and nutrition, nevertheless, such observations are of value. The following table shows how male garment workers were classified by the examiners as to the state of their development and nutrition.

TABLE 22.—*State of development and nutrition of male garment workers.*

Workers.	Development.						Nutrition.					
	Good.	Per cent.	Fair.	Per cent.	Poor.	Per cent.	Good.	Per cent.	Fair.	Per cent.	Poor.	Per cent.
Operators	248	25.7	462	47.9	255	26.4	473	49.0	331	34.3	161	16.7
Pressers	284	39.5	299	41.6	135	18.8	424	59.1	215	30.0	79	11.0
Finishers	45	16.1	121	43.4	113	40.5	117	42.0	104	37.4	58	20.8
Cutters	14	29.2	21	43.7	13	27.1	22	45.9	21	43.7	5	10.4
Tailors	10	18.5	23	42.6	21	38.9	25	46.3	18	33.4	11	20.4
Miscellaneous workers	15	60.0	7	28.0	3	12.0	15	60.0	6	24.0	4	16.0
Total	616	29.5	933	44.6	540	25.9	1,076	51.0	695	33.5	318	15.5

As is to be expected, among garment workers, the state of development is not on a par with that of nutrution. A good state of the latter is considerably more frequent than the former (51 per cent, as compared to 29.5 per cent). Pressers were the best developed and best nourished large class of garment workers, some of them possessing even magnificent muscular developments. Physiques of great excellence were also encountered among operators. Sixty per cent and 60 per cent among miscellaneous workers, 39.5 per cent and 59.1 per cent among pressers, 29.2 per cent and 45.9 per cent among cutters, 25.7 per cent and 49 per cent among operators, 18.5 per cent and 46.3 per cent among tailors, and 16.1 per cent and 42 per cent among finishers were respectively well developed and well nourished. The finishers, therefore, furnished the most unfavorable comparison with the other groups from the standpoint of development and nutrition.

Physique of garment workers.—In considering the impressions derived from the physical examination of garment workers, it was found that the pressers were the most robust from a physical standpoint. The finishers were decidedly inferior to all the others. This is but natural as the work of the presser not only requires considerable muscular exertion, but is also prosecuted in the standing posture. White,[1] in making a survey of the conditions under which women are employed in the State of Indiana, has called attention to the fact that girls who work in the standing posture are, on the whole, healthier looking and more robust than those engaged in sedentary occupations. The same seems true for male garment workers. The work of operators, while making no great demands upon the muscles, requires concentration, alertness, and speed, in order to earn a high wage. The work of the finisher, on the other hand, calls for these qualities to a minor degree only; therefore, we find, in the cloak, suit, and skirt trades, a gravitation of those whose efficiency is low, either by reason of age or physical inferiority to this class of work. This seems ample to account for the relatively poorer physical showing of finishers among male garment workers.

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[1] White, M. J.: Sanitary Survey of Indiana Industries Employing Woman Labor, Supplement No. 17 to the Public Health Reports.

The patellar reflex among male garment workers.—Data as to the state of the patellar reflex were gathered in 1,958 instances. In 1,708 instances this was normal, while in 250 instances abnormalities were observed. The patellar reflex was exaggerated in 156 instances or 8 per cent, was sluggish in 36 instances or 1.84 per cent, and could not be elicited in 58 instances or in nearly 3 per cent of the cases. Tailors exhibited the greatest variations from the normal in the state of the patellar reflex, in 11 cases out of 50 observations, the reflex being exaggerated, sluggish, or absent. Finishers came next with 15.8 per cent of abnormal patellar reflexes; pressers with 13.9 per cent; miscellaneous workers with 11.1 per cent; operators with 10.8 per cent and, lastly, cutters with 6.4 per cent abnormal reflexes. Of the three large groups of workers—namely, operators, pressers, and finishers, the finishers showed the greatest percentage of exaggerated reflexes with 8.7 per cent. Operators came next with 8.27 per cent and then pressers with 7.4 per cent. The reflex was sluggish or could not be elicited in 7.2 per cent of the finishers, 6.7 per cent of the pressers, and in 2.52 per cent of the operators.

FEMALE GARMENT WORKERS.

The female garment workers examined, were, for the most part, engaged in the dress and waist industries, 86.2 per cent of those examined being derived from this industry and 13.8 per cent from other needle trades. As compared to the cloak, suit, and skirt trades, the dress and waist trades present certain differences. In the first place the former industry is concerned in manufacturing garments from woolen fabrics, for the most part, which are heavier, darker, and made up upon lines usually simple and severe. These circumstances create conditions favorable to the employment of males, the manufacture of these garments being largely a question of mechanical skill once the design and cut of the garments is settled upon. In the dress and waist trades, however, the materials dealt with are largely cottons, silks, mercerized fabrics, and the like. There is a much greater variety of styles in the garments produced, the lots of the same styles being usually smaller. The fabrics, themselves, light colored, for the most part, and of various patterns must be handled more carefully to prevent soiling. There is more room for the exercise of the taste of the individual worker. The design of the garment and the skill in draping enter more into the value of the finished product as compared to the cost of the material than they do in the cloak, suit, and skirt trade. The dressmaker or the sewing girl is the natural prototype of the worker in the dress and waist trades as the journeyman tailor is in the cloak, suit, and skirt trades.

As a consequence we see, as mentioned before, that some 77 per cent of all the workers in the dress and waist industries are females.

General and Specific Occupations.—The female workers in the garment trades are perhaps less highly specialized than male workers in the cloak and suit trades. Only three classifications were accordingly made of female workers; i. e., operators, finishers, miscellaneous workers.

The duties of female operators and finishers are similar to those in the cloak and suit trades. Pressing is but a subsidiary operation in the dress and waist trades owing to the lightness of most of the materials used. Women engaged in pressing are therefore few in number, such pressing as is done being, for the most part, accomplished with light, electrically heated irons. The following table gives the general occupation (industry) and special occupation of the 1,000 girls examined:

TABLE 25.—*General occupation and special occupations of female garment workers.*

Special occupations.	Cloak and suit.	Dress and waist.	Bedding.	Boy's clothing.	Children's coats.	Corsets.	Fur.	Gloves.	Hat frames.	Men's clothing.	Millinery.	Neckwear.	Petticoats.	Umbrellas.	Underwear.	Total.
Operators	......	606	1	1	2	2	1	2	1	....	....	....	1	....	8	625
Finishers	111	68	....	....	2	....	1	....	....	1	1	1	....	1	....	186
Miscellaneous workers:																
Bookkeepers	......	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Buttonhole workers	......	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Cleaners	......	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Designers	......	......	....	....	....	....	....	....	....	....	....	....	....	....	1	1
Drapers	......	58	....	....	....	....	....	....	....	....	....	....	....	....	....	58
Dressmakers	......	17	....	....	....	....	....	....	....	....	....	....	....	....	....	17
Dress ornaments	......	3	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Embroiderers	......	3	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Examiners	......	38	....	....	....	....	....	....	....	....	....	....	....	....	....	38
Fellers	......	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Floor girls	......	8	....	....	....	....	....	....	....	....	....	....	....	....	....	8
Forewomen	......	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Hem stitchers	......	8	....	....	....	....	....	....	....	....	....	....	....	....	....	8
Label sewers	......	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Lace cutters	......	12	....	....	....	....	....	....	....	....	....	....	....	....	....	12
Packers	......	7	....	....	....	....	....	....	....	....	....	....	....	....	....	7
Pressers	......	18	....	....	....	....	....	....	....	....	....	....	....	....	....	18
Sample workers	......	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Stock clerks	......	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Trimmers	......	3	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Tuckers	......	4	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Not given	......	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Total	111	862	1	1	4	2	2	2	1	1	1	1	1	1	9	1,000

From this table it will be seen that there were examined 625 operators, 186 finishers, and 189 miscellaneous workers.

Eight hundred and sixty-two workers, or 86.2 per cent, were engaged in the dress and waist trades, 111 or 11.1 per cent, in the cloak and suit trades, and 27, or 2.7 per cent, in other needle trades.

Posture.—Female operators and finishers work in the sitting posture, while miscellaneous workers are about equally divided into workers who work sitting, standing, and both sitting and standing. Among the females examined 88 per cent worked sitting, 6.2 per cent worked both sitting and standing, while 5.7 per cent worked standing. Unlike the cloak and suit trade, in which approximately one-third the workers (the pressers) work in the standing position, 88 per cent of the workers examined in the dress and waist trades were sedentary in their postures.

Nativity and race.—The following table gives the nativity and race of the female workers examined:

TABLE 26.—*Nativity and race of 1,000 female garment workers.*

Nativity of 1,000 female garment workers.			Race of 1,000 female garment workers.		
Nativity.	Number.	Per cent.	Race.	Number.	Per cent.
Russia	741	74.1	Jewish	888	88.8
Austria-Hungary	101	10.1	Italian	77	7.7
Italy	70	7.0	German	18	1.8
United States	42	4.2	Polish	5	.5
Roumania	30	3.0	Irish	5	.5
Great Britain	8	.8	Magyar	1	.1
Germany	2	.2	Scotch	1	.1
Switzerland	2	.2	English	1	.1
Argentine Republic	1	.1	Roumanian	1	.1
Holland	1	.1	Dutch	1	.1
			French	1	.1

It will be seen from this table that 88.8 of the female workers examined belonged to the Jewish, 7.7 per cent to the Italian, 1.8 per cent to the German, and the remainder or 1.6 per cent to other races. As to nativity 74.1 per cent were born in Russia, 10.1 per cent in Austria, 7 per cent in Italy, 4.2 per cent in the United States, and the remainder in other countries. The female garment workers examined differed from male garment workers in the greater percentage of races other than Jewish and the greater percentage of native-born Americans.

Length of time in the United States.—Turning now to the average length of time of female garment workers in the United States, the average time since arrival in this country of 949 foreign-born female garment workers was 6.41 years. By groups, the average time spent in the United States by operators was 6.34 years, by finishers, 5.94 years, by miscellaneous workers, 7.135 years. As the average length of time foreign-born male garment workers had been in the United States was 9.25 years, foreign-born female garment workers had spent, on the average, 2.91 less years than the males in this country.

Length of time in special occupation.—The average times spent by female garment workers in their special occupation was found to be 4.63 years with the following average times for each group: Operators, 4.94 years; finishers, 4.79 years; miscellaneous workers, 3.67 years. The average times spent by females in their special occupations was, therefore, considerably less than that spent by males. There is also a greater difference in the average time spent in their special occupations and their average time in the United States, as compared with the males, indicating that the females did not take up their employment in the dress and waist trades, almost immediately after their arrival, as seems to have been the case with the males.

Previous occupations of female garment workers.—Seven hundred and twelve, or 77.2 per cent of the female workers had no previous occupation, while 288 workers, or 28.8 per cent reported that they had engaged in other occupations prior to the present one.

The following table gives the character of the previous occupations reported by female workers and the numbers engaged in each of them:

TABLE 27.—*Previous occupations of female garment workers.*

Previous occupation.	625 operators.	186 finishers.	189 miscellaneous workers.	Total.
Artificial flowers	3	....	1	4
Book agent	1	....	....	1
Bookkeeper	1	....	1	2
Chambermaid	1	....	....	1
Cigar maker	2	2	....	4
Cigarette maker	3	....	1	4
Cleaner (garments)	1	1	3	5
Clerk	1	....	....	1
Draper	4	....	....	4
Dressmaker	34	10	6	50
Embroiderer	3	2	2	7
Errand girl	7	1	3	11
Examiner	9	....	3	12
Feather worker	3	....	3	6
Finisher	27	[1] 6	10	43
Floor girl	5	....	5	10
Forewoman (assistant)	1	....	....	1
Fur worker	4	1	1	6
Garter maker	1	....	1	2
Grinder on glasses	1	....	....	1
Hairdresser	....	1	....	1
Hair worker	4	1	....	5
Handkerchiefs	1	....	....	1
Hand sewer	5	....	2	7
Hemstitcher	1	....	....	1
Housewife	8	5	....	13
Lace cutter	1	....	....	1
Laundress	....	2	2	4
Milliner	2	2	3	7
Neckwear	1	....	....	1
Novelty cards	....	....	1	1
Nurse girl	....	....	1	1
Office girl	....	....	2	2
Operator	[1] 3	6	20	29
Packer	3	....	....	3
Paperbox maker	1	....	....	1
Presser	....	....	1	1
Presser, white goods	2	....	....	2
Press feeder	1	....	....	1
Ribbon puller	....	....	1	1
Saleswoman	3	....	4	7
Sewing at home	1	....	....	1
Silk wearer	....	....	1	1
Stocking maker	....	1	....	1
Stone setter	....	....	1	1
Tailor	....	5	....	5
Tea packer	....	....	1	1

[1] Other trades.

TABLE 27.—*Previous occupations of female garment workers*—Continued.

Previous occupation.	625 operators.	186 finishers.	189 miscellaneous workers.	Total.
Trimmer (hats and caps)	1	6		7
Tucker	1		1	2
Typewriter			1	1
Underwear (ribboner)			1	1
Weaver (ribbons)	1			1
Winder, cotton factory			1	1
Total	152	52	84	288
No previous occupation	473	134	105	712
Total	625	186	189	1,000

While in the case of males some 77 per cent had been engaged in some previous occupation, less than 29 per cent of females had been previously so engaged. Of the 288 previously occupied females no less than 212, or 73.5 per cent, had previous occupations directly connected with the needle trades. The majority of these occupations were of a sedentary character, only 10 of the 67 reported, or about 15 per cent, requiring work other than of a sedentary nature.

Civil condition of female garment workers.—Of the 1,000 females examined, 865, or 86.5 per cent, were single; 71, or 7.1 per cent, were married; and 63, or 6.3 per cent, were widows. According to groups the following percentages were, respectively, married, single, and widowed:

TABLE 28.—*Percentages of married, single, and widowed.*

	Single.	Married.	Widows.
	Per cent.	*Per cent.*	*Per cent.*
Operators	89.9	5.92	4.16
Finishers	74.2	10.74	15
Miscellaneous workers	87.8	84.49	5.45

It will be seen that the female workers show very different conditions as to their civil state from the males, only 7.1 per cent being married and the remaining 92.9 per cent being either single or widowed. It will be remembered, among male garment workers over 73 per cent were married.

Children born to married female garment workers.—The number of children born to married female industrial workers is naturally of interest, in view of the influence engagement in an industry may have on child bearing.

The total number of children born to 71 married female garment workers up to the time of the examination was 129, or an average of 1.82 children to each married female garment worker, the average age of the married women being 29.39 years, or nearly the average of the male garment workers. The number of children actually living at the time of the examination was 97, or an average of 1.36 children to each married female garment worker. As 32 of the 129 children born had died prior to the time of the examination, the percentage of mortality among the children of married female garment workers was 24.8 per cent. Referring now to the 63 widows, it was found that these had borne 85 children, or an average of 1.35 children to each widow. Of these, 21 had died, leaving an average of 1.02 living children to each widow at the time of the examination. The percentage mortality observed was similar to that among married female garment workers, i. e., 24.7 per cent. Comparing this mortality with that observed among the children of married male garment workers, it is evident that there is considerable difference in favor of the children of married male garment workers, their percentage mortality being but 15.82, as compared to 24.8 per cent for married female workers.

This is but confirmation of the well-known truism, namely, that industrial mothers have a greater mortality among their children than the mothers not engaged in industries.

It is also evident that the number of children born to the married female garment workers is lower than that of the married male garment workers. The average in this latter group was 3.21 children, as compared to 1.82 for married female garment workers. These results are, therefore, in accordance with the facts hitherto observed, viz, that not only does the industrial occupation of married females interfere with child bearing, but at the same time it increases the mortality among the children born. This is exactly opposite to the effect on infant mortality of a declining birth rate, so far as a general population is concerned, this effect being to diminish the general mortality among infants. This arises from the fact that, in a general population, when fewer infants are born each infant receives better care and the diminished number of members of the family renders the economic position of each more advantageous.

Earnings of female garment workers.—Information as to the earnings of female garment workers was derived in the same way as for the males—that is, from their individual statements. This information is contained in the following table:

TABLE 29.—*Average annual earnings of 955 female garment workers.*

Occupation.	Amount.	Occupation.	Amount.
Miscellaneous workers	$445	Finishers	$294
Operators	377	All female workers	376

It will be seen, from the above table, that the average annual earnings of the female garment workers is much lower than those of the males, the average annual earnings of all male garment workers being $611.50, or 1.62 times greater. Only one group of females are in competition with the males, and that is the group of finishers, of whom 111 were finishers in the cloak, suit, and skirt trades, from which industry the male finishers examined were also derived. It will be remembered that the average annual earnings of male finishers were $486, as compared to $294 for female finishers. The annual earnings of male finishers are consequently 1.65 times greater than those of female finishers. Hence, they bear practically the same relation to the earnings of the female finishers as do those of female garment workers to the wages of male garment workers in general.

As is the case in the cloak, suit, and skirt trade, we encounter the same fluctuation in seasonal activity in the dress and waist trades.

The following chart, plotted from figures in the United States Census Report of 1910, shows very well this seasonal variation in activity in the women's garment trades.

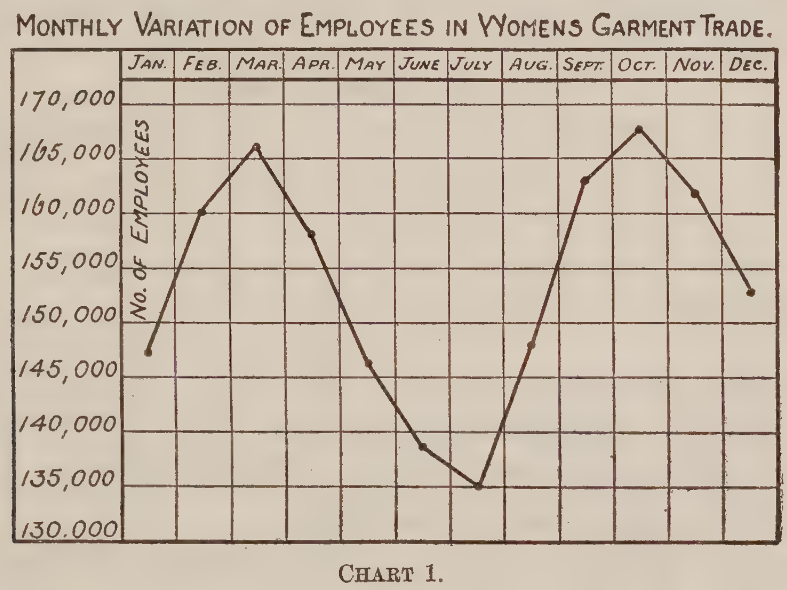

CHART 1.

Number of persons in families, number of rooms, and number of bedrooms in domiciles of female garment workers.—As, in the case of males, in connection with the annual earnings of female garment workers, the average number of persons in their families, the average number of rooms in their domiciles, and the average number of rooms used as bedrooms is of interest.

The following table shows these data in the case of 989 female garment workers in regard to whom this information was collected:

TABLE 30.—*Average size of family, average number of rooms, and average number of bedrooms of female garment workers, New York.*

Special occupation.	Number of observations.	Total of persons in families.	Average persons per family.	Number of observations.	Total of rooms in homes.	Average number of rooms in home.	Number of observations.	Total number of bedrooms in homes.	Average number of bedrooms in home.
Operators	619	3,572	5.77	623	2,709	4.35	614	1,287	2.10
Miscellaneous workers	187	1,094	5.85	187	818	4.37	185	377	2.04
Finishers	183	1,043	5.71	183	708	3.86	181	332	1.83
Total	989	5,709	5.78	993	4,235	4.26	980	1,996	2.04

Six female workers out of 989 lived alone, an average of 0.6 per cent.

From this table, it appears that out of 989 female garment workers but 6, or 0.6 per cent, lived alone, while the average number of persons in their families was 5.78. The average number of rooms in their domiciles was 4.26, and the average number of rooms used exclusively as bedrooms was 2.04. The average number of occupants per room in their domiciles was 1.35.

Hours of labor.—The hours of labor of female garment workers were the same as for the males, i. e., 50 hours per week (9 hours daily, with a half day on Saturday).

PHYSICAL DATA.

Average age of female garment workers.—The average age of 999 female garment workers was 22.86 years. By groups, the following ages were noted:

TABLE 31.—*Ages by groups.*

	Number.	Average age.
		Years.
Female operators	625	22.64
Female finishers	186	24.40
Female miscellaneous workers	188	22.09

It is seen that the finishers were the oldest group, the operators came next, and the miscellaneous workers were the youngest. The average age of all female workers was unexpectedly low, being practically 10 years less than that of the males.

The following table gives the age distribution of female garment workers by years up to the age of 29, and by 2-year periods for the remainder:

TABLE 32.—*Age distribution, female garment workers.*

Age.	Operators.	Finishers.	Miscellaneous workers.	Total.	Per cent.
15 years			1	1	0.1
16 years	10	3	7	20	2.0
17 years	21	6	14	41	4.1
18 years	34	10	22	66	6.6
19 years	61	20	17	98	9.8
20 years	70	23	19	112	11.2
21 years	70	14	12	96	9.6
22 years	103	15	25	143	14.3
23 years	78	20	18	116	11.6
24 years	39	13	14	66	6.6
25 years	40	8	7	55	5.5
26 years	24	8	12	44	4.4
27 years	11	8	1	20	2.0
28 years	17	4	7	28	2.8
29 years	9	3	3	15	1.5
30 to 32 years	18	7	1	26	2.6
33 to 35 years	4	6	3	13	1.3
36 to 38 years	7	6	1	14	1.4
39 to 40 years	5	6	3	14	1.4
41 to 44 years	1	4		5	.5
45 to 49 years	1	2	1	4	.4
50 to 54 years	1			1	.1
55 to 59 years	1			1	.1
60 to 64 years					
65 to 69 years					
70 to 74 years			1	1	.1
Total	625	186	139	1,000	100.0

Age distribution of female garment workers.—From this table it is seen that the highest age incidence falls in the twenty-second year, the twentieth year, and the twenty-third year being not far behind in this respect. Twelve and eight-tenths per cent of the workers were between 15 and 19 years, while 68.6 per cent of the workers were between 19 and 25; 81.3 per cent were between 16 and 25, while 92 per cent were less than 30 years of age.

The significance of the average age of female garment workers.—The low average age of female garment workers, together with other internal evidence to be adduced, points to the conclusion that unlike males females entered the women's garment trades as a provisional employment only pending their marriage. In the case of males, on the other hand, engagement in the garment trade may be regarded as a permanent means of livelihood.

In support of this view we have the following points of evidence:

1. The low average age of female garment workers.—But a relatively small proportion of them had passed the marriageable ages. Most of the persons of these ages were already married or widows, the average ages of these being 29.39 years, but little lower than the average of male garment workers (32 years).

2. In spite of very much lower wages we have the circumstance that but 6 out of 989 workers lived alone. The average number of members in the families of female garment workers were higher (5.78 for the females as compared to 5.35 for the males), the average number of rooms in their domiciles was greater (4.26 as compared to 3.89), and the number of rooms used exclusively as bed rooms was also greater (2.04 as compared to 1.58). The number of occupants per room was also slightly less in the case of the families of female garment workers as compared to those of the males (1.35 as compared to 1.37). This indicates that the majority of female garment workers were members of families in which they were not the chief bread winners. In addition to this the average length of time females had engaged in their special occupations as compared to the males was considerably less, being 4.63 years for females as compared to 9.28 years for males, or almost exactly one half.

Besides this 47 per cent of the female garment workers who had married were widows, indicating that when they had become dependent through the death of their husbands, they entered or reentered the trade. The low percentage of married women among female workers, compared to the high percentage of married males, is further evidence of the provisional character of the engagement of females in the garment trades.

Still further evidence is contained in the annual earnings of female garment workers. These average but $7.25 per week, a sum insufficient for complete economic independence in a city such as New York.

We see, therefore, that there is a considerable difference in the economic status of male and female garment workers. The males not only had to earn sufficient money to maintain themselves but also to support families, large as a general rule. In the case of the females the evidence seems to point to the conclusion that in the great majority of instances these girls had homes and were only partially dependent upon their earnings for their maintenance.

Height, weight, abdominal circumference, and chest measurement of female garment workers.—The average height of 986 female garment workers in their stocking feet was 60.3 inches. The following table gives the distribution of the heights observed:

TABLE 33.—*Distribution of heights of 985 female garment workers.*

[Height measured in stockings.]

Height.	Number of observations.	Mean height.	Height.	Number of observations.	Mean height.
		Inches.			*Inches.*
54 to 55 inches	2	54.4	62 to 63 inches	135	62.3
55 to 56 inches	15	55.4	63 to 64 inches	82	63.2
56 to 57 inches	33	56.3	64 to 65 inches	28	64.2
57 to 58 inches	72	57.4	65 to 66 inches	2	65.2
58 to 59 inches	113	58.3	66 to 67 inches	4	66.1
59 to 60 inches	168	59.3	68 to 69 inches	1	68.0
60 to 61 inches	179	60.3			
61 to 62 inches	151	61.3	Total	985	....

Distribution of heights of female garment workers.—It will be seen from this table that 818 female garment workers, or a little over 83 per cent, were between 57 and 63 inches tall. The minimum observed was 54.3 inches and 68 inches the maximum. There was practically no difference in the average heights of the various groups of female workers as there was in the case of the male garment workers, among whom, it will be remembered, pressers were considerably taller and heavier than finishers.

Weight.—The average weight of 986 female garment workers was 119.9 pounds. If the average weight of females 60 inches high is taken to be in the neighborhood of 110 pounds, it will be seen that female garment workers are rather heavy for their heights. The weights of the females were measured with the subject clothed only in a sheet, so the weights given are nearly those of the stripped individual. There was no essential difference observed between the weights of the various groups of females as was the case in the males.

Circumference of the chest.—The average circumference of the chest at rest of 986 female garment workers was 31.99 inches. At forced expiration this measurement was 31.88 inches and at full inspiration the average circumference was 33.24 inches. The average expansion was, therefore, 1.36 inches. The mean circumference of the chest at rest of 28 male garment workers whose height was between 60 and 61 inches was 33.12 inches. They therefore exceeded females in the circumference of the chest at rest by 1.13 inches.

Like the males, the average chest expansion was low, being 1.36 inches for females, as compared to 1.75 inches for males. It should be stated, in the opinion of the writer, that, owing to the development of the breasts, chest measurements in females are not likely to be of the same accuracy as is the case in males.

There was no significant difference observed between the chest circumferences in the various groups of female workers.

Abdominal circumference.—The average abdominal circumference at the level of the umbilicus was 31.2 inches in 956 female garment workers. It will be seen, therefore, that the excess of chest over the abdominal circumference in female garment workers was 0.79 inch as compared to 2.85 inches for all male garment workers between 60 and 61 inches tall. The average abdominal circumference of male workers of this height was also slightly less than that of the females, being 30.82 inches, as compared to 31.2 inches.

Strength of grip of female garment workers.—The average strength of grip of 990 female garment workers was 16 kgs. for the right and 13 kgs. for the left hands. There were no important differences observed in the average strength of grip in the various groups of workers. The maximum grips observed were 30 kgs. for the right hand and 30 kgs. for the left hand with right and left hand minima of 2 kgs. each. It is seen that the average strength of grip of the females is less than one-half of that found for the males (i. e., 33.6 kgs. for the right and 31 kgs. for the left hands). The maximum right and left hand observations registered for males (65 kgs. and 61 kgs.) are also well over twice the maxima registered for females.

Evidence of protection against smallpox.—Good vaccination scars were present in the case of 907, or 90.7 per cent, of the 1,000 female workers examined; 16, or 1.6 per cent, were protected by a previous attack of smallpox; 77, or 7.7 per cent, showed no evidence of previous successful vaccination. The previous prevalence of smallpox among females was lower than among the males (1.6 per cent, as compared to 2.9 per cent). A somewhat greater percentage showed no evidence of previous successful vaccination (7.7 per cent, as compared to 4.98 per cent).

Pulse rate, blood pressure, and percentage hemogloblin.—The average pulse rate noted in 977 observations was 78.8 This exceeds the average pulse rate of the males by two beats. The table following shows the distribution of the pulse rates observed.

TABLE 34.—*Distribution of pulse rate, female garment workers.*

Pulse rate.	Operators.	Finishers.	Miscellaneous workers.	Total.	Per cent.
55 to 59	1		1	2	0.205
60 to 64	21	5	4	30	3.07
65 to 69	29	9	7	45	4.61
70 to 74	219	80	57	356	36.4
75 to 79	87	23	24	134	13.7
80 to 84	139	29	42	210	21.5
85 to 89	34	16	15	65	6.65
90 to 94	35	14	13	62	6.35
95 to 99	13	6	6	25	2.56
100 to 104	14	4	5	23	2.36
105 to 109	7	1	3	11	1.13
110 to 114	6		1	7	.712
115 to 119	3			3	.306
120 to 124	1		1	2	.24
125 to 129	1			1	.1
130 to 134					
135 to 139					
140 to 144			1	1	.1
Total observations	610	187	180	977	

Not stated, 23.

It will be seen from this table that the most usual frequency observed was between 70 and 74, with the frequency of 80 to 84 next in order. The maximum rate observed was 140 to 144 (in a case of hyperthyroidism); the lowest, between 53 and 59 in a normal subject. In 71.6 per cent of the observations the frequency was between 70 and 84, while in 82.86 per cent of the cases it lay between 65 and 89. There was very little difference in the average pulse rates observed for the several groups.

Blood pressure of female garment workers.—The average systolic blood pressure of 999 female garment workers was 113.39 millimeters, while the average diastolic pressure observed was 79.92 millimeters. The average pulse pressure was, therefore, 33.47 millimeters.

The following table gives the distribution of the systolic and diastolic blood pressures observed:

TABLE 35.—*Distribution of blood pressure, female garment workers.*

SYSTOLIC.

Millimeters of mercury.	Operators.	Finishers.	Miscellaneous workers.	Total.	Per cent.
80 to 89	7	1		8	0.8
90 to 99	57	17	15	89	8.9
100 to 109	159	44	49	252	25.2
110 to 119	210	58	67	335	33.5
120 to 129	141	35	45	221	22.1
130 to 139	38	18	7	63	6.3
140 to 149	7	7	3	17	1.7
150 to 159	2	3	1	6	.6
160 to 169	2	2		4	.4
170 to 179	1		2	3	.3
180 to 189	1			1	.1
Total	625	185	189	999	

TABLE 35.—*Distribution of blood pressure, female garment workers*—Continued.

DIASTOLIC.

Millimeters of mercury.	Operators.	Finishers.	Miscellaneous workers.	Total.	Per cent.
50 to 59	14	3	2	19	1.9
60 to 64	79	18	25	122	12.2
70 to 79	224	62	74	360	36.0
80 to 89	173	60	54	287	28.7
90 to 99	101	35	19	155	15.5
100 to 109	27	4	10	41	4.1
110 to 119	5	2	3	10	1.1
120 to 124		1	1	2	.2
130 to 139	1		1	2	.2
140 to 149	1			1	.1
Total	625	185	189	999	

It will be seen from this table that 808, or 80.7 per cent, of the systolic pressures observed lay between 100 and 129 millimeters, while 802, or 80.1 per cent of the diastolic blood pressures lay between 70 and 99 millimeters. Fourteen systolic blood pressures, or 1.4 per cent, exceeded 150 millimeters, while 8, or 0.8 per cent, were less than 90 millimeters. In the case of the males 165, or approximately 8 per cent, of the systolic pressures reached 150 millimeters or more. We therefore find pathological hypertension about 5.7 times as common among the males as the females. Undoubtedly factors in creating this difference lie both in the low average age of the females and also the greater uniformity of the latter as to age, over 92 per cent being less than 30 years.

In addition to this we find very few of the females had ever followed any other than a sedentary occupation. These two facts would account sufficiently for the absence of any large percentage of hypertension among the females.

Hemoglobin percentage of female garment workers.—As was the case in the examination of the males the Tallquist scale was used in computing the percentage of hemoglobin in the blood of female garment workers. These determinations are subject to the same corrections as for the males. The average hemoglobin, as computed by this scale, was 77.8 per cent, a reading which is probably about 8 per cent too low (see under examination of male workers). Considering readings below 75 per cent hemoglobin, on the scales employed, as being significant of deficiency of hemoglobin in the case of females, who give normally somewhat lower readings than males, 118 or 11.8 per cent of the female workers had hemoglobin percentages below 75 per cent.

The table following classifies these observations according to the observed percentages.

TABLE 36.—*Hemoglobin observations below 75 per cent, female garment workers.*

Occupation.	Below 73.	Below 72.	Below 70.	Below 68.	Below 65.	Below 60.	Below 55.	Total.
Operators	2	32	30	1	2		1	68
Finishers		11	10	1	1	1		24
Miscellaneous	2	9	14	1				26
Total	4	52	54	3	3	1	1	118

Per cent of total observations (994) having hemoglobin below 75, 11.9.
Maximum observation, 95 per cent hemoglobin.

From this table it will be seen that 4 of the recorded percentages were below 73 per cent, 52 below 72 per cent, 54 below 70 per cent, 3 below 68 per cent, 3 below 65 per cent, 1 below 60 per cent, and 1 below 55 per cent.

The minimum reading was between 55 and 50 per cent. Among males the number of observations below 80 per cent (which in the case of males with scales employed was held to be indicative of beginning anemia) was 96, or about 4.2 per cent. It is thus seen that anemia seemed to be about 2.8 times as common among female as among male garment workers.

Development and nutrition of female garment workers.—The remarks previously made with respect to observations as to the state of development and nutrition of male garment workers apply equally to the females.

The following table gives the state of the development and nutrition of female garment workers, as classified by the examiners:

TABLE 37.—*State of the development and nutrition of female garment workers.*

Occupation.	Development.							Nutrition.						
	Good.	Per cent.	Fair.	Per cent.	Poor.	Per cent.	Total.	Good.	Per cent.	Fair.	Per cent.	Poor.	Per cent.	Total.
Operators	441	70.6	154	24.6	30	4.8	625	404	64.5	177	28.4	44	7.1	625
Finishers	112	60.2	60	32.2	14	7.6	186	109	58.6	58	31.2	19	10.2	186
Miscellaneous	109	57.7	61	32.2	19	10.1	189	108	57.1	54	28.6	27	14.3	189
All	662	66.2	275	27.5	63	6.3	1,000	621	62.1	289	28.9	90	9.0	1,000

From this table it would appear that the operators constituted the best developed class of female garment workers, 70.6 per cent being said to be well developed, 24.6 per cent fairly developed, and 4.8 per cent poorly developed, while miscellaneous workers made the poorest showing, the figures being 57.7, 32.2, and 10.1 per cent, respectively. The general percentages for all female garment workers were 66.2, 27.5, and 6.3 per cent for good, fair, and poor development. In regard to the nutrition 62.1 per cent of all female garment workers were regarded as well nourished, 28.9 per cent as fairly nourished, and 9 per cent as poorly nourished. We find, according to the opinion of the examiners, a parallelism between the state of the nutrition and the development of females. The observations recorded in regard to the development and nutrition of the males show a considerable preponderance of those regarded as well nourished, compared to those whose development was also considered good, the former class being greatly in the majority. It is thought that this arises from the fact that greater variations exist in the muscular development of the male. There is probably a greater similarity in the lives of females, as regards influences affecting their development than in the case of males, temperament, disposition toward exercise, the choice of an occupation, and similar circumstances often having a marked influence upon male development, whereas in females, it seems reasonable to assume, with their lesser inclination to violent exercises, coupled with their usually indoor life, that the influences affecting their development will be far more uniform than in the case of the male.

Pelvic measurements of female garment workers.—Observations as to the pelvic measurements of female garment workers were made in 825 instances, the measurements taken being the external conjugate diameter, and the distances between the anterior superior spines and that between the iliac crests.

The following averages were found:

	cm.
Anterior superior spines	24. 37
Iliac crests	27. 1
External conjugate	19. 08

Among the 825 thus measured, 5, or 0.6 per cent, had generally contracted pelves of the justo-minor type, and 4, or 0.49 per cent, had flattened pelves.

General physique of female garment workers.—The general impression of the physique of female garment workers was not unfavorable on the whole. Their condition of youth and the lack of family responsibilities which they enjoyed, naturally made for a greater cheerfulness and vivacity on the part of the females which would intensify such favorable impression. As a class they were inclined to be short and rather stocky with a tendency to overweight.

As stated elsewhere in this report, with males, engagement in the garment trades seemed to them the serious business of life; the necessity for obtaining work paramount. With the females, on the other hand, in the majority of instances the attitude toward their work showed that they thought of it as provisional only, the expectation of marriage and the establishment of a home being always in the background.

DEFECTS AND DISEASES OF GARMENT WORKERS.

Statistics on defects and diseases.—The defects and diseases in male and female garment workers were observed and recorded in 3,086 instances, 2,086 males and 1,000 females. The total number of defects and diseases observed was 13,457 of which 9,541 were present in males and 3,916 in females. This gives a general average of 4.36 defects or diseases per person examined, the average number of defects per person being 4.57 for males and 4.33 for females. Classified by groups the average number of defects and diseases noted to each person examined was as follows:

Males.—Operators, 4.38; pressers, 4.62; finishers, 5.04; tailors, 4.33. 5.63; cutters, 3.77; miscellaneous workers, 4.17.

Females.—Operators, 3.63; finishers, 4.49; miscellaneous workers, Only two per cent of those examined were found free from defects of any kind.

It is seen that tailors among males, and finishers among females, were, as a class, the most defective, followed in order by finishers, pressers, miscellaneous workers, operators and cutters among males and miscellaneous workers and operators among females. The following table gives a list of the defects and diseases observed in garment workers:

TABLE 38.—*Defects and diseases observed in 2,086 male and 1,000 female garment workers.*

Defect or disease.	Male workers.						Female workers.			Total.		
	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous workers.	Operators.	Finishers.	Miscellaneous workers.	Males.	Females.	Both sexes.
Abscess:												
Connective tissue, head				1						1		1
Dental periosteum		1					1			1	1	
Acne vulgaris	33	13	11	3	3		31	7	10	63	48	121
Addison's disease		1								1		1
Adenoids	3						3		1	3	4	7
Adenoma of breast							1				1	1
Adhesions, intestinal, post-operative							1				1	1
Albinism	1									1		1
Albuminuria	19	18	5	2	1		(1)	(1)	(1)	45		45
Alopecia areata	1	1								2		2
Amblyopia								2			2	2
Amenorrhea							1		3		4	4
Anemia	37	31	23	3	2		68	24	26	96	118	214
Anesthesia, traumatic, skin of chest	1									1		1
Angina pectoris			1							1		1
Angioma of leg	1									1		1
Angioma of palate	1									1		1
Angioma of tongue		1								1		1
Ankylosis of hip joints		1								1		1
Appendicitis, chronic	7	1	3	1	1		12	3	2	13	17	30
Argyria of conjunctiva	1									1		1
Arterio-sclerosis	20	35	9		1			1	2	65	3	68
Arthritis:												
Deformans	1	1					1			2	1	3
Gonorrheal	2									2		2

[1] Female urine not tested.

TABLE 38.—*Defects and diseases observed in 2,086 male and 1,000 female garment workers*—Continued.

Defect or disease.	Male workers.						Female workers.			Total.		
	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous workers.	Operators.	Finishers.	Miscellaneous workers.	Males.	Females.	Both sexes.
Arthritis of shoulder joint			1							1		1
Asthenia							3	4			7	7
Asthma, bronchial	14	1	1	1			3			17	3	20
Atony, intestinal							1				1	1
Atrophy:												
Muscular, progressive		2								2		2
Muscles of leg							1				1	1
Atrophy of testicle:												
Left	1	4		1						6		6
Right	2									2		2
Azoospermia	1									1		1
Blepharitis, chronic		1	2				5	1	3	3	9	12
Blind:												
Left eye	2	1		1						4		4
Right eye	2	1								3		3
Bowlegs									1		1	1
Bradycardia	1	1			1					3		3
Bronchitis:												
Acute catarrhal	13	6	6				1	2	2	25	5	30
Chronic	21	40	16	3		1	5	3	3	81	11	92
Bursitis:												
Prepatellar		1								1		1
Scapular	1									1		1
Subacromial		1								1		1
Carbuncle	1									1		1
Cataract		1					1			1	1	2
Incipient	1		2							3		3
Traumatic		1								1		1
Chalazion		1								1		1
Chloasma							1				1	1
Cirrhosis of liver	1	1		1						3		3
Clubfoot	2	1								3		3
Colitis									1		1	1
Mucous	1									1		1
Color blindness	25	18	10	1	1	1	1			56	1	57
Conjunctivitis:												
Acute catarrhal	6	5	5				1			16	1	17
Chronic	2	2					7	4	3	4	14	18
Follicular	6	1			1	2	2			10	2	12
Constipation, chronic	259	92	75	21	14	5	170	49	49	466	268	734
Contracted pelvis							4		1		5	5
Contusion of chest	1									1		1
Corneal opacity	6	8					1			14	1	15
Curvature of spine, angular		2								2		2
Cyst:												
Cricothyroid	1									1		1
Dermoid, of face							1				1	1
Ovarian							1				1	1
Sebaceous, of chest							1				1	1
Sebaceous, of scalp		1		1						2		2
Cystitis, chronic	1									1		1
Cystocele							1				1	1
Dacryocystitis	1						2	1		1	3	4
Deaf mute		1								1		1
Defective hearing	105	110	53	8	2	5	42	14	9	281	65	346
Defective posture	229	226	97	14	9	7	65	31	18	582	114	696
Defective speech	5	3					1			8	1	9
Defective teeth	158	240	93	19	3	3	78	83	65	516	226	742
Defective vision	643	467	218	47	31	16	457	152	132	1,422	741	2,163
Deflected nasal septum	121	62	17	9	5	3	19	5	12	217	36	253
Deformity of chest, occupational		1								1		1
Deformity of chest, rachitic	9	14	4	2			15	4	10	29	29	58
Deformity of chin, cicatricial		1								1		1
Deformity of foot, traumatic							1				1	1
Deformity of pelvis, rachitic									1		1	1
Delayed menstruation							2	3	5		10	10
Dermatitis repens	1		1							2		2
Dermographia	1	1								2		2
Diabetes insipidus			1							1		1
Diabetes mellitus	4	8	4	1				1		17	1	18
Dilatation of colon, chronic		2	1							3		3

TABLE 38.—*Defects and diseases observed in 2,086 male and 1,000 female garment workers*—Continued.

Defect or disease.	Male workers.						Female workers.			Total.		
	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous workers.	Operators.	Finishers.	Miscellaneous workers.	Males.	Females.	Both sexes.
Dilataion of heart			1						1	1	1	2
Dilataion of stomach									1		1	1
Dislocation:												
Congenital of hips	1									1		1
Head of radius (old)		1								1		1
Hip joint (old)	1									1		1
Shoulder joint (old)	1									1		1
Dysmenorrhea							125	29	46		200	200
Membranous									2		2	2
Eczema	9	5	3	1		1	5	2	1	19	8	27
Elongation of uvula	1	7	1			1	1		1	10	2	12
Emphysema of lungs	22	30	12	6			1		1	70	2	72
Empyema of antrum		2								2		2
Empyema of frontal sinus		2								2		2
Endometritis, chronic							3	8	3		14	14
Entropion		1								1		1
Epilepsy		1									1	1
Epiphora		1								1		1
Episcleritis								1			1	1
Exostosis, metacarpal bones							1				1	1
Exostosis of rib							1				1	1
Favus (fingernails)									1		1	1
Favus of scalp (old)		3								3		3
Fecal impaction								1			1	1
Fibroid phthisis		1	1				1			2	1	3
Fibroma of breast								1			1	1
Fissure, anal	1						3	1		1	4	5
Fistula, anal	1									1		1
Flat feet:												
Slight	70	51	20	2	3	1	25	8	4	147	38	185
Moderate	163	96	52	10	7	7	84	30	33	335	147	482
Severe	66	28	16	1	4	2	7	3	13	117	23	140
Flattened pelvis							2		2		4	4
Furunculosis		3								3		3
Ganglion, extensor tendons hand	1	1					1			2	1	3
Gastritis:												
Acute, cat	2			1	1		1			4	1	5
Chronic	7	4	5				14	5	8	16	27	43
Gastric neurosis				1						1		1
Gastric ulcer	1			1			1	3	1	2	5	7
Gastro-enteritis							1				1	1
Gastrorrhea	1									1		1
Glaucoma		1								1		1
Gleet	1									1		1
Glycosuria, transitory		1								1		1
Goiter, parenchymatous	3		1				1	4		4	5	9
Gonorrhea	6	5	4		1					16		16
Gynecomastia	1									1		1
Hallux valgus	26	24	8				35	8	12	58	55	113
Hammer toe	5	7	1				5	1	3	13	9	22
Harelip							1				1	1
Hay fever	1									1		1
Hemeralopia	1									1		1
Hemicrania							2	1			3	3
Hernia:												
Left inguinal—												
Incomplete	5	9	2		1					17		17
Complete	7	12	5	1			1			25	1	26
Right inguinal—												
Incomplete	13	13	3		1					30		30
Complete	10	9	4							23		23
Double inguinal—												
Incomplete	9	19	3		1					32		32
Complete		7	3	1	1					12		12
Femoral		4	1							5		5
Umbilical	1	1	1				1			3	1	4
Ventral	2		2	1					1	5	1	6
Herpes:												
Facial	1									1		1
Genital	2									2		2
High blood pressure	40	91	22	12			6	5	3	165	14	179
Hodgkin's disease	1									1		1

TABLE 38.—*Defects and diseases observed in 2,086 male and 1,000 female garment workers*—Continued.

Defect or disease.	Male workers.						Female workers.			Total.		
	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous workers.	Operators.	Finishers.	Miscellaneous workers.	Males.	Females.	Both sexes.
Hydrocele		5	2							7		7
Hyperchlorhydria	13	3	3	1	1		6	1	1	21	8	29
Hyperhydrosis	2	3								5		5
Hyperthyria							8	3	1		12	12
Hypertrophy of heart	17	17	5	2	2		1	0	1	43	2	45
Hypertrophy, prostate	1		1							2		2
Hypertrophy, tonsils	141	76	36	4	5	6	119	43	42	268	204	472
Hypertrophy of turbinate bones	16	8	1	2	1		34	8	7	28	49	77
Hypertrophy of thyroid gland	2	2	1					5	0	2	5	7
Hypochlorhydria									1		1	1
Hypospadias		1								1		1
Hypothyria							1	1			2	2
Hysteria							4	2			6	6
Impetigo			1							1		1
Impotence	11	2	2							15		15
Incontinence of urine							1				1	1
Indigestion, intestinal	1	1	2							4		4
Induration of liver, cyanotic.	1									1		1
Infantile uterus									2		2	2
Inflamation of—												
Connective tissue of foot.									2		2	2
Ethmoid cells	3									3		3
Lymph glands	1	2	1				4		4	4	8	12
Mammary gland	1							1		1	1	2
Postate gland	4			1						5		5
Ingrowing toenails	2	1	1				1			4	1	5
Insufficiency of inferior rectus							1				1	1
Insufficiency of superior rectus							1				1	1
Intermittent heart's action.	1	2								3		3
Intermittent and irregular heart's action	6	4	1				1	1	3	11	5	16
Intertrigo							1				1	1
Iritis	1									1		1
Irregular menstruation							16	4	2		22	22
Jaundice, catarrhal			1				1			1	1	2
Keloids							1				1	1
Keratitis		1								1		1
Kyphosis:												
Slight	148	70	22	4	2	3	7	2	1	249	10	259
Moderate	2	4	2					2	1	8	3	11
Marked	3	4	1	1			1	1		9	2	11
Kypho-scoliosis:												
Slight	10	1	1				1	1		12	2	14
Moderate	2		2	1				1		5	1	6
Marked	3	4	1	1			1			4	1	5
Laryngitis:												
Acute	1								1	1	1	2
Chronic	13	9	4	2		1	5			29	5	34
Leukemia, spleno-medullary		1								1		1
Leukodermia								1			1	1
Leukorrhea							35	19	15		69	69
Lichen planus									1		1	1
Lipoma of arm		1								1		1
Lipoma, diffuse				1						1		1
Lipoma of leg		1								1		1
Lordosis:												
Slight	3	2			1		14	1	3	6	18	24
Marked		1								1		1
Loss of eye:												
Left		2								2		2
Right		1			1					2		2
Loss of fingers:												
Left hand (2)		2								2		2
Right index		2								2		2
Loss of great toe		1	1							2		2
Low blood pressure (below 100 mm.)	22	12	9	1	1	1	13	1	1	46	15	61
Lumbago	2									2		2

TABLE 38.—*Defects and diseases observed in 2,086 male and 1,000 female garment workers*—Continued.

Defect or disease.	Male workers.						Female workers.			Total.		
	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous workers.	Operators.	Finishers.	Miscellaneous workers.	Males.	Females.	Both sexes.
Malnutrition	......	......	......	......	......	......	8	2	4	......	14	14
Menorrhagia	......	......	......	......	......	......	18	6	7	......	31	31
Merycism	......	1	......	......	......	......	......	......	......	1	......	1
Metatarsalgia, Morton's	1	......	......	......	......	......	......	......	......	1	......	1
Metritis, chronic	......	......	......	......	......	......	1	1	......	......	2	2
Metrorhagia	......	......	......	......	......	......	3	......	3	......	6	6
Milium	1	1	......	......	......	......	......	......	......	2	......	2
Molluscum fibrosum	......	1	......	......	......	......	......	......	......	1	......	1
Myalgia	3	......	......	......	......	......	......	......	......	3	......	3
Mycosis of skin	......	1	......	......	......	......	......	......	......	1	......	1
Myocarditis	......	1	1	1	......	......	......	......	1	3	1	4
Myotonia	......	......	......	......	......	......	1	......	......	......	1	1
Nasal obstruction (old fracture)	......	1	......	......	......	......	......	......	......	1	......	1
Nephritis, chronic	1	6	2	2	......	......	1	......	......	11	1	12
Nephroptosis	4	2	......	......	2	......	6	1	1	8	8	16
Neurasthenia	58	10	12	4	5	......	6	1	1	89	8	97
Neurasthenia, sexual	......	1	......	1	......	......	......	......	......	2	......	2
Neuritis; brachial plexus:												
Left	1	2	......	......	......	......	......	......	......	3	......	3
Right	......	1	......	......	......	......	......	......	......	1	......	1
Neuritis:												
Ext. cutaneous nerve	......	......	1	......	......	......	......	......	......	1	......	1
Intercostal nerves	......	......	......	......	......	......	1	1	......	2	......	2
Sciatic nerve	2	3	2	......	......	......	1	1	......	7	2	9
Supra-orbital nerve	......	......	......	......	......	......	1	1	......	......	2	2
Nevus	......	2	......	......	......	......	......	......	......	......	......	......
Nystagmus	2	......	......	......	......	......	......	......	......	2	......	2
Obesity, extreme	5	1	3	4	......	......	5	8	2	13	15	28
Occupational pains	32	15	8	2	......	......	3	......	1	57	4	61
Oophoritis	......	......	......	......	......	......	1	1	......	......	2	2
Orchitis, chronic	1	......	......	......	......	......	......	......	......	1	......	1
Osteo-arthritis of spine	......	2	4	......	......	......	......	......	......	6	......	6
Osteoma of tibia, right	1	......	......	......	......	......	......	......	......	1	......	1
Osteo-myelitis, chronic, of tibia	......	1	......	......	......	......	......	......	......	1	......	1
Otitis media:												
Acute catarrhal	2	......	......	......	......	......	......	......	......	2	......	2
Chronic catarrhal	38	57	5	4	1	......	29	8	5	105	42	147
Suppurative	17	14	3	1	2	......	20	6	6	37	32	69
Ovary enlarged	......	......	......	......	......	......	1	......	......	......	1	1
Overriding toes	10	8	......	......	......	......	5	2	2	18	9	27
Oxaluria	1	......	2	2	......	......	......	......	......	5	......	5
Papilloma, nasal septum	1	......	......	......	......	......	......	......	......	1	......	1
Papilloma of skin, extensive	......	2	......	......	......	......	......	......	......	......	2	2
Paralysis agitans	......	1	......	......	......	......	......	......	......	1	......	1
Paralysis of facial nerve	1	1	......	......	......	......	......	......	......	2	......	2
Paralysis of recurrent laryngeal nerve	1	1	......	......	......	......	......	......	1	2	1	3
Paraplegia, arm and leg, left	1	......	......	......	......	......	......	......	......	1	......	1
Paronychia, chronic, of toe	......	......	......	......	......	......	1	......	......	......	1	1
Pediculosis	1	2	1	......	......	......	4	......	......	4	4	8
Perforation, nasal septum	1	......	......	......	......	......	......	......	......	1	......	1
Periostitis of tibia	......	1	......	......	......	......	......	......	......	1	......	1
Pharyngitis:												
Acute	1	......	......	......	......	......	1	......	......	1	1	2
Chronic	154	104	56	3	5	5	24	7	14	327	45	372
Naso	14	23	9	4	1	3	33	12	9	54	54	108
Phlebitis	......	......	......	......	......	......	......	1	......	......	1	1
Piles:												
External	62	54	21	1	2	......	19	8	4	140	31	171
Internal, and mixed	28	44	19	7	2	1	24	7	4	101	35	136
Pityriasis versicolor	15	14	2	1	......	......	16	3	6	32	25	57
Pleura, thickened from old empyema	......	......	......	......	......	......	1	......	......	......	1	1
Pleurisy:												
Fibrinous	18	19	10	2	2	......	16	3	6	51	25	76
With effusion	......	1	......	......	......	......	......	......	......	1	......	1
Polypoid degeneration, nasal mucous membrane	1	......	......	......	......	......	......	......	......	1	......	1
Polypus of auditory meatus	......	1	......	......	......	......	......	......	......	1	......	1
Polypus, nasal	4	1	......	......	......	......	4	......	......	5	4	9

TABLE 38.—*Defects and diseases observed in 2,086 male and 1,000 female garment workers*—Continued.

Defect or disease.	Male workers.						Female workers.			Total.		
	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous workers.	Operators.	Finishers.	Miscellaneous workers.	Males.	Females.	Both sexes.
Polypus of soft palate	1									1		1
Polypus, uterine								1			1	1
Pregnancy							1	1			2	2
Premature ejaculation	2		2							4		4
Premature senility	1	5	1							7		7
Prolapse of rectum	1									1		1
Pruritus ani	1	1								2		2
Psychasthenia	3		1							4		4
Psoriasis	14	5	5				3	1		24	4	28
Pterygium	1	1								2		2
Ptosis of eyelids		1		1			1		1	2	2	4
Purpura hemorrhagica			1						1	1	1	2
Pyorrhea alveolaris	205	170	77	19	7	2	87	37	34	480	158	638
Rectocele								1			1	1
Relaxed sacro-sciatic ligaments	2	2								4		4
Retinitis pigmentosa								1			1	1
Reynaud's disease		1								1		1
Rheumatism							3	2	1		6	6
Acute							1				1	1
Rhinitis:												
Acute catarrhal	6	1	2		1		6	1		10	7	17
Atrophic	6	5	1	2			15	5	4	14	24	38
Hypertrophic	291	190	84	11	14	8	108	36	30	598	174	772
Rhinophyma		1								1		1
Salpingitis								2			2	2
Scabies	2	2	2							6		6
Scoliosis:												
Slight	336	227	106	19	19	11	102	18	34	718	154	872
Moderate	6	6	2	2			3	2	6	16	11	27
Marked	14	7	1				2	1	0	22	3	25
Seborrhea (marked)	3			1						4		4
Shortening of leg, left (old fracture)		1								1		1
Sinus, pilonidal	1									1		1
Sluggish circulation							7	4	2		13	13
Soft chancre	1									1		1
Spasm of leg (muscular)							1				1	1
Spur, nasal septum	4	4					9	1	3	8	13	21
Stone in kidney				1						1		1
Strabismus:												
Convergent				1						1		1
External	7	1					1	2		8	3	11
Internal	2	5					2	1		7	3	10
Stricture of urethra		1								1		1
Stye		4	1					1		5	1	6
Supernumerary nipple	7			1	1					9		9
Sycosis				1	1					2		2
Synechia:												
Anterior	1									1		1
Posterior	1									1		1
Syphilis	1	2						1		3	1	4
Tabes dorsalis		1		1						2		2
Tachycardia	1	2					5			3	5	8
Teno-synovitis		1	1							2		2
Tonsillitis:												
Acute							1				1	1
Chronic	11	2	1				2			14	2	16
Trachoma:												
Active	4	3	1							8		8
Old	3	2		1			2			6	2	8
Tubercle of lungs (active)	22	26	10	1	1		4	3	1	60	8	68
Tubercle of lymph glands	1	1	1				1			3	4	7
Tubercle of larynx			1							1		1
Tubercle of testicle			1							1		1
Tubercle of lungs:												
Arrested	8	13			1		4	1	2	22	7	29
Suspected	9	5	4	2			3	3	3	20	9	29
Typhoid fever								1			1	1
Tumor, fibroid of uterus							1	1			2	2
Valvular disease of heart:												
Aortic	2	5	1							8		8
Mitral	11	14	2				8	8	6	27	22	49

TABLE 38.—*Defects and diseases observed in 2,087 male and 1,000 female garment workers*—Continued.

Defect or disease.	Male workers.						Female workers.			Total.		
	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous workers.	Operators.	Finishers.	Miscellaneous workers.	Males.	Females.	Both sexes.
Valvular disease of heart—Continued.												
Mitral and aortic	......	1	1	......	......	......	......	......	......	2	......	2
Tricuspid	......	......	......	......	......	......	......	1	......	......	1	1
Varicocele	22	21	3	......	2	......	......	......	......	48	......	48
Varicose veins of legs	12	45	4	......	1	......	7	10	6	62	23	83
Visceroptosis and gastroptosis	26	15	2	2	1	......	6	4	3	46	13	59
Ulcer of auditory meatus	......	1	......	......	......	......	......	......	......	1	......	1
Ulcer of cornea	......	......	......	......	......	......	2	......	......	......	2	2
Ulcer of skin of leg	......	1	......	......	......	......	......	......	......	1	......	1
Undescended testicle	2	1	3	......	......	......	......	......	......	6	......	6
Urticaria	......	......	......	......	......	......	1	......	2	......	3	3
Uterine displacement:												
Anteflexion	......	......	......	......	......	......	......	......	1	......	1	1
Prolapse	......	......	......	......	......	......	2	2	......	......	4	4
Retroflexion	......	......	......	......	......	......	2	......	......	......	2	2
Retroversion	......	......	......	......	......	......	3	1	......	......	4	4
Web toes	......	......	......	......	......	......	1	......	......	......	1	1
Total defects and diseases	4,228	3,320	1,412	304	181	96	2,277	832	807	9,541	3,916	13,457
Average number of defects per person	4.38	4.62	5.04	5.63	3.77	4.17	3.63	4.49	4.33	4.57	3.92	4.36

The number of defects and diseases recorded is very large. It should be borne in mind, however, that it was the practice to note all defects present. A large number of these undoubtedly were of minor importance and did not impair the health or the efficiency of the individual concerned.

On the other hand, a large number of the defects or diseases did impair more or less seriously the health or efficiency of the subject. In many cases the presence of such defect or disease was unsuspected by the individual, who, in every instance, was given advice as to the proper steps for correcting the condition. Owing to the arrangements previously referred to, which were made with Cornell Medical School, many garment workers were referred to this dispensary, when they had no family physician, and others were referred to their family physicians. The workers did not avail themselves in every instance of this advice, but a total of 421 workers, 378 males and 91 females, reported at the Cornell clinic for treatment, besides those who went to their family physicians.

Glancing over this table it will be seen that certain defects and diseases were exceedingly common among garment workers. It should, however, be stated at once that no class of disorders peculiar to the garment trades were found, or which would not probably be found with like frequency in similar groups of workers engaged in sedentary, indoor occupations.

Frequent or significant defects and diseases.—Proceeding now to the discussion of the more frequent or significant defects and diseases among garment workers, the following shorter table of such defects and diseases, together with percentages of incidence in males and females, is inserted at this point for the sake of convenience in reference:

TABLE 39.—*Frequent or significant defects or diseases among male and female garment workers.*

Defect or disease.	Males.		Females.	
	Number.	Per cent.	Number.	Per cent.
Anemia	96	4.6	118	11.9
Albuminuria (1,512 male specimens) of urine	45	2.98	...	...
Appendicitis, chronic	13	.6	17	1.7
Arterio-sclerosis	65	2.86	3	.3
Bronchitis, chronic	81	3.87	11	1.1
Color blindness	56	2.7	1	.1
Constipation, chronic	466	22.3	268	26.8
Defective hearing	281	13.4	65	6.5
Defective posture	582	27.9	114	11.4
Defective teeth	576	27.0	226	23.6
Pyorrhea alveolaris	480	25.7	158	15.8
Defective vision	1,422	68.2	741	74.1
Deflected nasal septum	217	10.4	36	3.6
Diabetis mellitus (1,392 tests for sugar)	17	1.22	...	...
Emphysema of lungs	70	3.35	2	.2
Flat and weak feet (all degrees)	599	28.7	208	20.8
Gastric ulcer	2	.1	5	.5
Hernia (all varieties)	152	7.8	2	.2
High blood pressure (150 mm. and over)	165	7.9	14	1.4
Hyperthyria	...	...	12	1.2
Hypertrophy of tonsils	268	12.8	204	20.4
Low blood pressure (below 100 mm.)	46	2.2	15	1.5
Menstrual disorders:				
Amenorrhea (not physiological)	...	...	4	.4
Delayed menstruation	...	...	10	1.0
Dysmenorrhea	...	...	202	20.2
Irregular menstruation	...	...	22	2.2
Menorrhagia	...	...	31	3.1
Nervous affections	207	10.0	32	3.2
Otitis media (chronic catarrhal, and suppurative)	142	6.8	74	7.4
Pharyngitis and naso-pharyngitis	381	18.2	99	9.9
Piles, external, internal, and mixed	241	11.5	66	6.6
Pleurisy, fibrinous	51	2.44	25	2.5
Rhinitis, atrophic, and hypertrophic	612	29.3	198	19.8
Spinal curvature (all grades)	1,050	50.3	205	20.5
Trachoma:				
Active	8	.4	...	...
Old	6	.3	2	.2
Tuberculosis	65	3.11	12	1.2
Valvular disease of heart	37	1.79	23	2.3
Varicose veins of legs	62	3.0	23	2.3
Visceroptosis, including gastroptosis and nephroptosis	54	2.6	21	2.1

Anemia.—Only mild grades of secondary anemias were found to be present, as a rule. The lowest percentage of hemoglobin, according to the Tallquist scale, encountered among 1,998 male garment workers, was 65 per cent and between 50 and 55 per cent in 999 females. Four and six-tenths per cent of the males had percentages of hemoglobin below 80 per cent and 118 females, or 11.9 had percentages below 75 per cent. Considering that the scales used, gave readings on the average of from 8 to 10 per cent too low, and that males usually show, on the average, about 5 per cent higher percentage of hemoglobin than females, it is thought that the percentages herewith reported are very fair, so far as the males are concerned. The condition of the blood of females can not be regarded as being so satisfactory, in view of the fact that low percentages of hemoglobin were about 2½ times as frequent among females as among males. The fact that a large proportion of the females examined consisted of young individuals, of the age at which mild types of chlorosis seem rather common, helps to account, to a certain extent at least, for the greater frequency of low hemoglobin percentages among females.

Another factor, undoubtedly of importance, is the greater variety in food, chosen by males as a sex, their heartier appetites, and, to coin a phrase, their better dietetic instinct. While the observations show that, as a class, the females presented good nutrition, malnutrition, among poorly nourished females, seemed more marked than in the case of the males.

One point was well emphasized by the determination of the hemoglobin percentages. This was the unreliability of the attempts to determine the richness or poverty of the blood by the appearance of the individual. Many of the workers examined, who, judging by their pallor, or the color of the mucous membranes, would be considered anemic upon this evidence alone, had, upon estimation, a normal percentage of hemoglobin, whereas, in a number of instances, individuals whose color was apparently good, had hemoglobin percentages decidedly below the normal.

Albuminuria.—The urine of the males only was systematically examined. As a result of the examination of 1,512 specimens, 45 urines, or 2.98 per cent were albuminous. In 11 cases, at least, other signs of chronic nephritis, such as hypertrophy of the heart, and hypertension were present. In a majority of the instances, however, the fact that the urine might be albuminous was not suspected from the condition of the individual until the specimen was examined.

Appendicitis, chronic.—Chronic appendicitis seemed more prevalent than might be supposed, this condition being diagnosed upon the history of previous attacks, tenderness and signs of past inflammation in the right iliac fossa. The condition, contrary to the usual observations, was found to be nearly three times as common among females as among males, being diagnosed in 1.7 per cent of the females and 0.6 per cent of the males. Thirty additional males, or 1.4 per cent, and 19 females, or 1.9 per cent of those examined had undergone previous appendectomies.

Arteriosclerosis.—Sixty-five males, or 2.86 per cent, and three females, or 0.3 per cent, gave well marked indications of arteriosclerosis. The great preponderance of this observation on the side of the males is well accounted for by the greater average age of the males.

Chronic bronchitis and emphysema of the lungs.—Chronic bronchitis and emphysema of the lungs seemed relatively frequent among male garment workers but more than 3 times less frequent among the females. Chronic bronchitis was present 81 times and emphysema of the lungs 70 times among the males examined, while these conditions were found only 11 times and twice each among the females examined. The respective incidences of these two diseases were for males 3.87 per cent and 3.35 per cent, while, for females these were 1.1 per cent and 0.2 per cent. Among males instances of these diseases were found principally among pressers, finishers, and tailors, the latter having the highest percentages, both of chronic bronchitis and emphysema of the lungs (5.56 and 11.1 per cent).

It is seen that the frequency of these conditions was greatest in the oldest class of garment workers, viz, the tailors. It is thought that there are two causes which would predispose toward chronic bronchitis and emphysema of the lungs, so far as garment workers are concerned. The first is the sedentary posture, in the case of tailors and finishers, the second, and previous occupation in trades requiring severe muscular exertion in the case of the pressers.

The diminution in the respiratory excursion of the ribs entailed by vicious postures in sedentary occupations favors the early calcification of the costal cartilages, thus predisposing to the development of emphysematous conditions of the lungs, while the fixation of the thorax, determined by strong muscular efforts must also be regarded as a predisposing factor in the development of these conditions. More stress has been laid in the foregoing on the incidence of emphysema of the lungs than that of chronic bronchitis for the reason that in the majority of cases, the bronchitis was secondary to the emphysematous condition.

Color blindness.—It was thought it might be of interest to determine the incidence of color blindness among garment workers. The Holmgren set of test worsteds was used for this purpose. Fifty-six, or 2.7 per cent, of the male garment workers were found to be color blind while only 1 of the females, or 0.1 per cent, was so affected. While it is well known that color blindness is decidedly more common among males than among females, the very low incidence of color blindness among the females examined is doubtless due to the selective influence of the dress and waist trade. Fabrics in the cloak, suit, and skirt trades are woolen and for the most part dark or neutral in tint, while the colors of the fabrics in the dress and waist trades are likely to be bright and variegated. Color-blind persons would be at considerably more disadvantage in the dress and waist trades than in the cloak, suit, and skirt industry, because of the need of matching fabrics, combining tints, and selecting variously colored thread in the former occupation.

Chronic constipation.—Approximately 22.3 per cent of the males and 26.8 per cent of the females examined suffered from habitual constipation. A considerably larger number, while not habitually constipated, complained of the state of their bowels, as to irregularity, attacks of constipation, and the like. Among males this condition was most frequent in tailors with 38.9 per cent, next in cutters, with 29.2 per cent, finishers with 26.9 per cent, operators with 26.6 per cent, and lastly the pressers with 12.5 per cent suffering from habitual constipation. Among females habitual constipation was most marked in operators, with 27.3, while both finishers and miscellaneous workers were somewhat less constipated, their percentages being about 21 per cent each.

Among males it is probable that the standing posture of pressers, together with the twisting movements of the trunk in their occupation, may account for the considerably lower percentage suffering from habitual constipation in this group.

It is true among cutters, who work also in a standing posture, that the percentage of those suffering from habitual constipation is high. The cutter, however, is not required by his occupation to put forth the muscular efforts of the presser, nor are his movements likely, in so great a degree, to bring the muscles of the trunk and abdomen into play. So far as females are concerned, the predisposition of women to constipation is well known, owing to their usually quiet life, weaker abdominal muscles, and lack of regularity of habits.

In addition to purely occupational conditions, such as defective posture and the sitting position which favor habitual constipation, it would seem that certain dietetic factors in the case of garment workers predisposed to this condition.

The use of green vegetables and fresh fruit among garment workers was small, and milk was very generally drunk, especially at lunch time. Perhaps, however, the most important personal factor in inducing this condition was the very general neglect on the part of garment workers of forming regular habits of defecation. Leaving their homes for their work hurriedly in the morning, the visit to the toilet is put off for some more convenient time and is too often forgotten in the stress of work at the shop.

Resort to laxatives and purgatives was very common among garment workers. Many of them had the "cathartic" habit, the individual stating that his bowels moved only when some purgative was taken. In connection with habitual constipation the number of garment workers suffering from piles was considerable, 241 males, or 11.5 per cent, and 66 women, or 6.6 per cent, suffered from external, internal, or mixed piles.

Defective hearing.—Impaired hearing seemed to be relatively common among garment workers. The hearing was defective in 281 males, or 13.4 per cent, and 65 females, or 6.5 per cent. One hundred and forty-two males, or 6.8 per cent, and 75 females, or 7.5

per cent, were found to be suffering from chronic catarrhal or from suppurative middle-ear disease. Among some of the females with this condition the hearing was, as yet, not demonstrably impaired, while in some of the males with defective hearing, apart from collections of wax, no changes were visible in the tympanic membrane.

Until further comparative data shall have been collected by the examination of workers in other industries, it is, of course, impossible to say to what extent garment workers suffer from impaired hearing, as compared to other groups of workers. There seems ground, however, for the belief that the number of persons suffering from impaired hearing among garment workers is in excess of that in the general population. As will be discussed later, a very large number of chronic catarrhal affections of the nose and throat were present among garment workers. It is probable in many instances that the chronic middle-ear disease observed to be present resulted from an extension of the catarrhal condition of the nose and throat.

Effects of noise.—Apart from catarrhal conditions, the effect of exposure to continuous noise is well known to impair hearing. The deafness of boiler makers and riveters is proverbial. Garment workers are by no means free from the effects of noisy conditions. Several banks of sewing machines, all electrically driven, produce a vibratory roar which, through the years, can not be without effect upon the hearing apparatus.

Defective posture.—Although the figures in the table show that 582, or 27.9 per cent, of the male workers, and 114, or 11.4 per cent, of the females had defective posture, the actual number was considerably greater. At the outset of the examination, unfortunately, data as to the posture were not collected unless this was bad. Later, notes of the posture were taken in the case of 1,073 males.

The following table gives the number and percentage of good, fair, and bad postures observed in this group:

TABLE 40.—*Posture of 1,073 male garment workers.*

Posture.	Operators.	Per cent.	Pressers.	Per cent.	Finishers.	Per cent.	Tailors.	Per cent.	Cutters.	Per cent.	Miscellaneous.	Per cent.	Total.	Per cent.
Good	117	21.9	79	21.5	21	18.75	2	8.7	11	42.3	3	25	233	21.7
Fair	169	31.7	85	23.2	23	20.50	8	34.8	9	34.6	2	16.6	296	27.5
Bad	247	46.4	203	55.3	68	60.6	13	50.5	6	23.0	7	58.4	544	......
Total	533	......	367	......	112	......	23	......	26	......	12	......	1,073	......

It will be seen that among 1,073 male garment workers in 21.7 per cent the posture was good, in 27.5 per cent was fair, and in 50.8 per cent the posture was bad. The finishers, with 60.6 per cent of bad postures showed the highest number of postural faults; the cutters with 23 per cent of bad postures held themselves the best, on the whole.

Varieties of bad posture.—Two main varieties of bad posture were distinguished: First, the kyphotic posture, with rounded shoulders, contracted chest, arms dangling forward, the normal curvature of the lumbar spine partly obliterated, the belly muscles relaxed, the buttocks flattened, and the knees partly flexed; and second (for want of a better name), the "slanting backward" posture, in which the abdomen is protruded, the upper part of the thorax leans backwards, and the weight is borne in a large measure upon the heels.

In the first posture the principal strain seems to be borne by the spinal and sacro-iliac ligaments; in the second by the pubo-femoral ligaments.

Combinations of both postures were also met with.

The vicious element in both these postures lies in the circumstance that a disproportionally small amount of the strain of keeping the trunk erect is thrown upon the body muscles, while the stress upon the bones, ligaments, and joints is disproportionately great.

The following photographs (Plates I–III) give a good idea of these postures as observed. Nos. 1 and 2 show the "kyphotic" posture, No. 3, the "slanting backward" posture, No. 4, a combination of the two. That such postures are by no means a necessary accompaniment of occupation in the garment trades is shown by the fact that many workers were seen whose muscular development and postures were excellent in every way.

Effects of previous military training.—In view of the foreign birth of the majority of garment workers, the question will at once arise as to the effects upon the posture due to compulsory military training. It may at once be stated that military training in the youth of the individual exerted a prolonged and favorable influence upon the posture. The following figures (Nos. 5, 6, 7, 8, and 9) show the excellent postures of several garment workers who had received military training during youth. The case of the subject shown in figure 9 is especially noteworthy. This individual, now 59 years of age, served in the Austrian army about 26 years ago. Although now the subject of mild emphysema of the lungs and chronic bronchitis, he suffers but little inconvenience from this defect and does his work easily. It is seen that, apart from possessing good muscular development, his shoulders are flat and his posture excellent.

Effects of physical exercise on the posture.—The following photographs show young garment workers who, though having no previous military training, were interested in physical exercise. The subject in figure No. 10 is particularly interested in swimming, No. 11 in wrestling, while No. 12, originally an ironworker, maintains the excellent muscular development acquired in this trade by regular exercise.

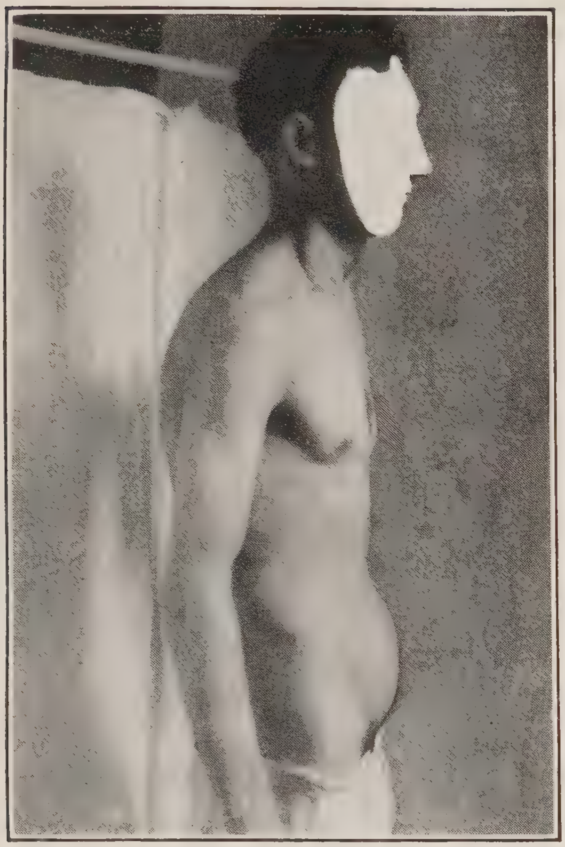

Fig. 1.—Kyphotic posture.

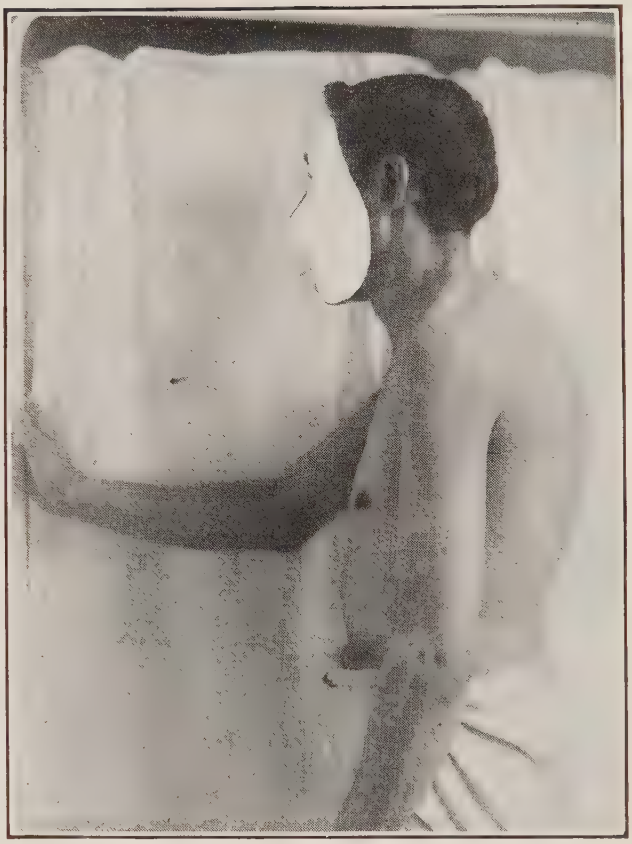

Fig. 2.—Kyphotic posture.

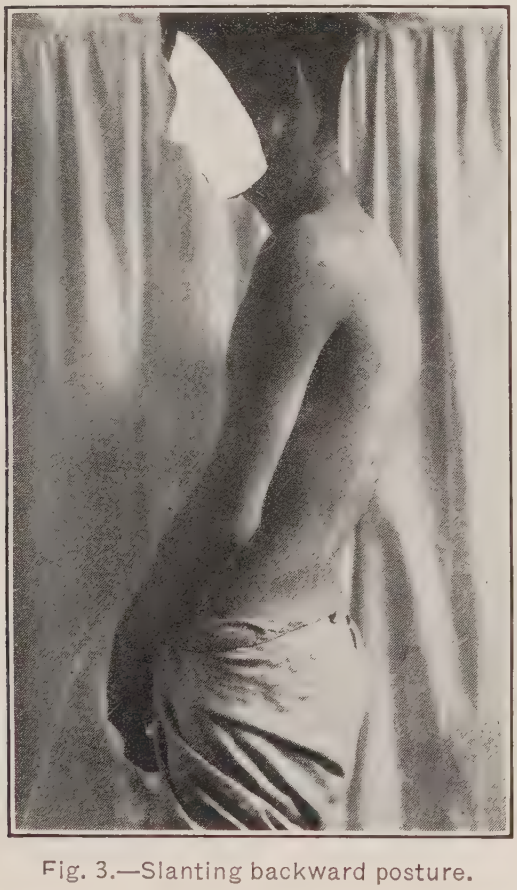

Fig. 3.—Slanting backward posture.

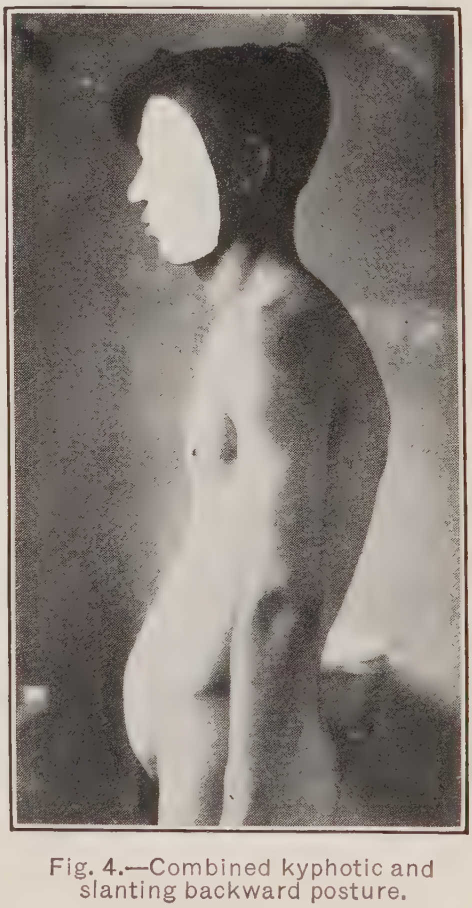

Fig. 4.—Combined kyphotic and slanting backward posture.

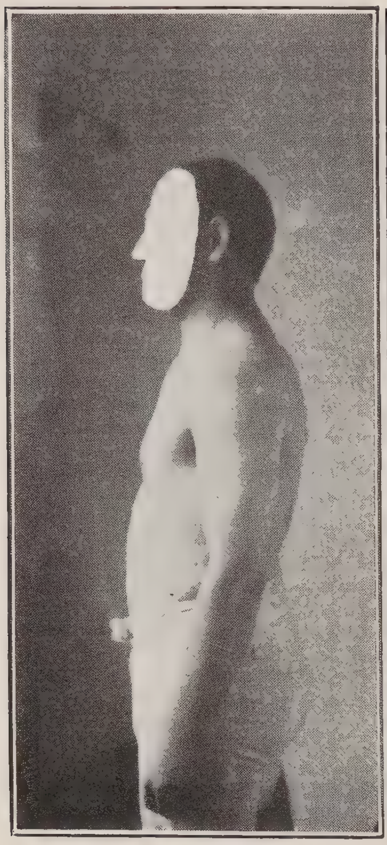

Fig. 5.

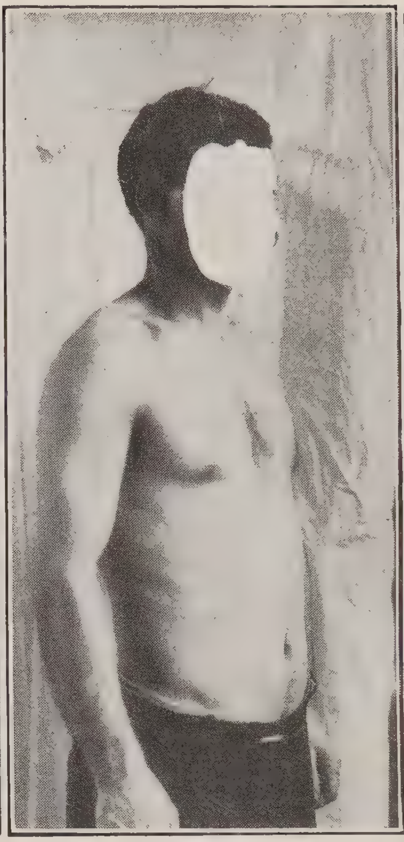

Fig. 6.

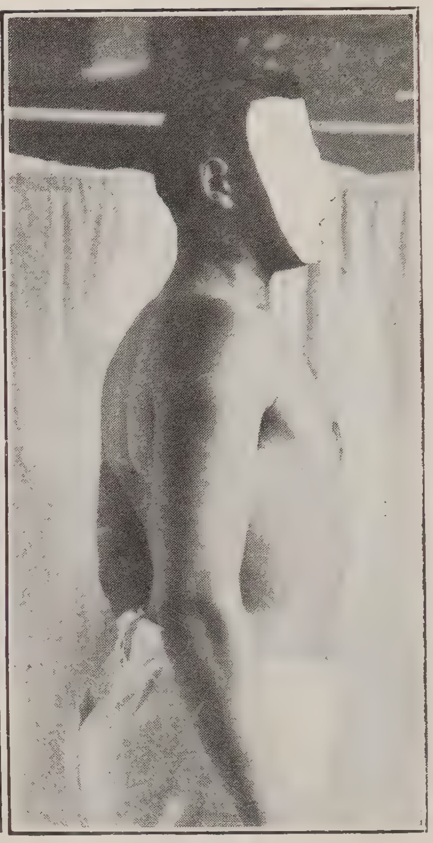

Fig. 7.

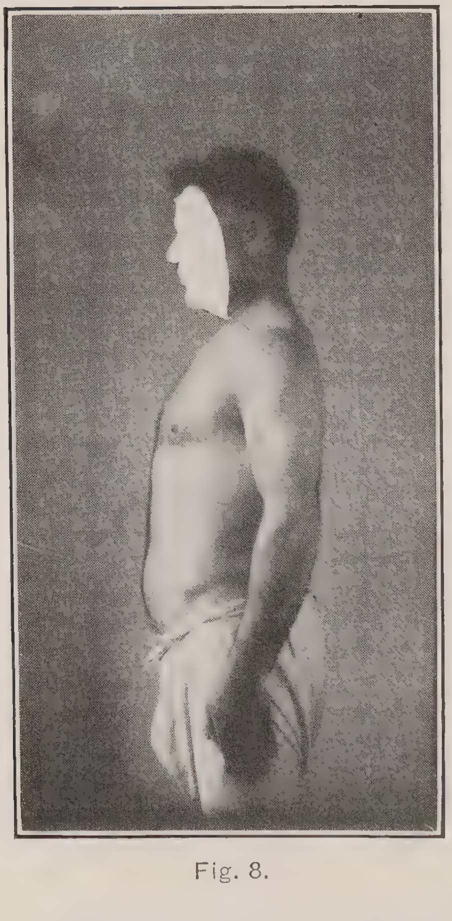

Fig. 8.

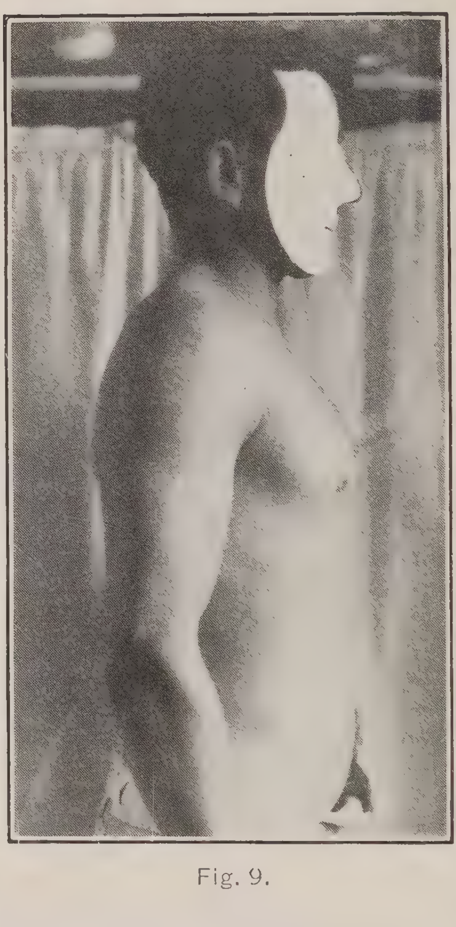

Fig. 9.

Excellent postures in garment workers, the result of previous military training.

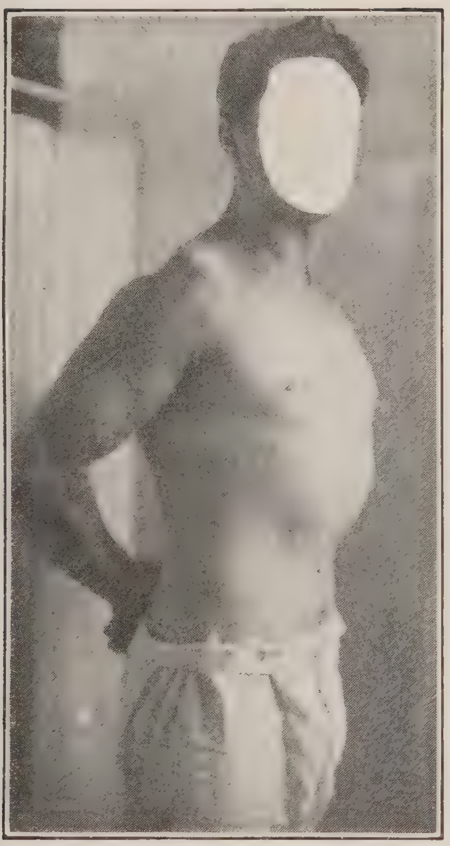

Fig. 10.

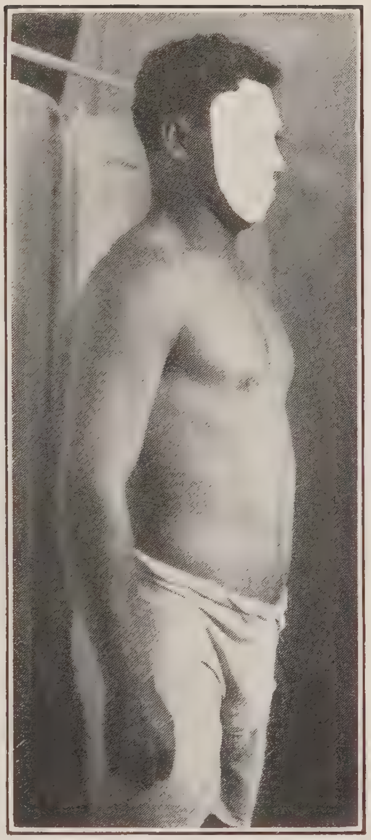

Fig. 11.

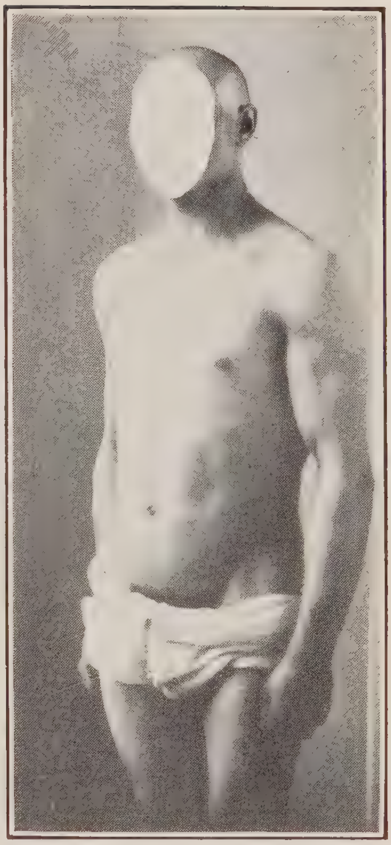

Fig. 12.

Excellent postures in garment workers, the result of physical training.

While some allowance should be made for added excellence from conscious pride in their physiques, so far as the posture is concerned, still it seems quite evident that these young men, so long as they still take interest in the condition of their bodies, will suffer no harmful postural effects from their occupation.

Posture of females.—While the postural habits of females were not studied so carefully as those of the males, still it was evident that defective postures were not so frequent among them. In the first place, the modern corset appears to be a decided aid in preventing very bad postures. Secondly, consciousness of the personal appearance is a far more powerful influence in females than it is in males. Inasmuch as until very recently the prevailing styles and the type of corset used are not becoming unless the posture assumed by the wearer be more or less correct, we have in females a powerful incentive to good postures which is not operative for males. Besides this, in females their average age was so low that as a rule the normal tendency of human beings to "slump" when habitually sedentary had not as yet time to overcome the operation of other influences which in females tend to make for a good posture.

Spinal defects.—In connection with the discussion of posture, reference will now be made to the occurrence of spinal curvatures among garment workers. A large number of such defects were noted among the workers examined. It was a rather rare circumstance to encounter a spine completely straight.

The following table shows the types of spinal curvature met with, the frequency and the extent of such defects:

TABLE 41.—*Spinal defects of male and female garment workers.*

Defect or disease.	Male workers.						Female workers.			Summary.				
	Operators.	Pressers.	Finishers.	Tailors.	Cutters.	Miscellaneous workers.	Operators.	Finishers.	Miscellaneous workers.	Total males.	Per cent.	Total females.	Per cent.	Total, both sexes.
Kyphosis:														
Slight	148	70	22	4	2	3	......	2	1	249	11.9	3	0.3	252
Moderate	2	4	2	....	....	....	......	2	1	8	.38	3	.3	11
Marked	3	4	1	1	....	....	......	1	....	9	.43	1	.1	10
Kypho-scoliosis:														
Slight	10	1	1	....	....	....	......	1	....	12	.57	1	.1	13
Moderate	2	......	2	1	....	....	......	1	....	5	.24	1	.1	6
Marked	3	1	......	....	....	....	......	....	....	4	.19	....	......	4
Lordosis:														
Slight	3	2	......	....	1	....	......	....	....	6	.29	....	......	6
Moderate	......	......	......	....	....	....	......	....	....	......	......	....	......	......
Marked	......	1	......	....	....	....	......	....	....	1	.05	....	......	1
Scoliosis:														
Slight	336	227	106	19	19	11	......	18	34	718	34.4	52	5.2	770
Moderate	6	6	2	2	....	....	......	2	6	16	.77	8	.8	24
Marked	14	7	1	....	....	....	......	1	....	22	1.05	1	.1	23
Total	527	323	137	27	22	14	......	28	42	1,050	......	70	......	1,120

It will be seen from this table that there were 1,050 cases of spinal curvatures of all kinds among males and 205 among females, a total of 1,255 cases.

Of these 872 were slight degrees of scoliosis, 14 slight degrees of kyphosis, and 24 slight cases of lordosis. Of marked cases of spinal curvatures of various kinds there were 42, of which 36 were in males and 6 in females.

Nevertheless, small degrees of spinal curvature are not without result upon the well-being of the individual. They are, as a rule, indicative of faulty poise, an index of muscular and ligamentous strain improperly distributed in the past. While, in many instances, no effects are felt by the individual, in others lumbar pains are a source of discomfort and disability, owing to undue strain being thrown upon one set of sacro-iliac ligaments by reason of the spinal curvature.

Effects of faulty posture upon the health of the individual.—The bad effects of a faulty posture upon the individual are well known. The fundamental physical error committed, in habitually maintaining an incorrect posture, lies in fact that the principal strain of poising the body does not fall upon the trunk muscles, where it properly belongs, but upon bones, ligaments, and articular surfaces.

While, in muscular physiques, the most impressive development is that of the shoulder girdle and extremities, the really important muscular development, in such physiques, is that of the abdominal and back muscles.

These muscles, when correctly developed and used, so poise the trunk that the weight is balanced over the extremities with a minimum of strain on the bodily framework.

When, on the other hand, the task of maintaining the upright position is thrown, not upon the muscles, where this properly belongs, but upon bones and ligaments, a vicious circle is created. The trunk muscles, through disuse, or atrophy, fail to develop thus throwing progressively increasing strain upon the skeletal structures. These in turn gradually yield under the strain, so that, as time passes, the vicious posture is intensified.

Besides the lowered metabolism caused by the lessened demand, through disuse, of an important part of the muscular system (the trunk muscles), we see other evil effects upon health resulting from vicious postures.

Effects upon the respiratory system.—The drooping shoulders and bowed back deprive the intercostal muscles of their "point d'appui," so that respiration becomes mainly diaphragmatic. The chest, more or less immobilized by the defective posture, prevents the free expansion of the lungs, so that the volume of air displaced at each respiration is relatively small. Another condition also interfering with the expansion of the lungs is the diminished intra-abdominal space and the resulting increased intra-abdominal pressure, which is discussed later. This makes for lowered oxygenation and rate of respiratory exchange, thus diminishing the metabolic change.

The bones of the thorax, held more or less motionless for long periods, tend, by early calcification of the costal cartilages and by weakness, through disuse of the intercostal muscles, to become a rigid framework, the active area of the lungs being correspondingly diminished. Undoubtedly, we have here a condition interfering with the proper nutrition of the lungs, creating places of minor resistance, favoring the development of chronic pulmonary affections, such as emphysema and chronic bronchitis, and, last but not least, tuberculosis. So much then for the effects of faulty postures upon the respiratory organs. We have still to consider the effects of faulty posture upon the other organs of the body.

Effects of bad posture upon the abdominal organs.—Though the abdominal organs are connected to the body wall by various ligamentary structures, the frequent occurrence of displacements of these organs shows that these ligaments of themselves are incompetent to maintain the viscera in their correct relative positions. The agency in keeping the intra-abdominal structures in place is the tonus of the abdominal muscles, aided, to a certain extent, by atmospheric pressure.

Inasmuch as the abdominal, like the pleural, is a closed cavity, all its internal structures are in close contact with their neighbors and with the abdominal walls, of which the mobile portions are accurately applied to the contours of the contained organs, and follow changes in the volume of the hollow viscera.

The tendency which the abdominal organs have to press against the belly wall gives rise to the "intra-abdominal pressure" which is resisted by the tonus of the abdominal muscles.

Now the effects of bad postural habits upon the abdominal contents are twofold. In the first place the substitution of an anterio-posterior bowing of the spine, for the normal spinal curves, together with the greater task thrown upon the diaphragm by reason of the relative immobility of the thorax during respiration, tends to decrease the amount of intra-abdominal space. As a consequence, the intra-abdominal pressure is increased and the contained viscera tend to press more strongly against the abdominal wall. The points of origin and attachment of the abdominal muscles being brought nearer together by reason of the bowed posture, these muscles no longer can resist so effectively the increased intra-abdominal pressure by means of their natural tonus.

Secondly, the continuous adoption of faulty postures, throwing the strain of maintaining the balance more upon bones and ligaments than upon muscle, makes for deficient development or atrophy through disuse of the abdominal muscles. These then are stretched and lose their normal tonus by reason of the increased intra-abdominal pressure.

As the hollow viscera will always expand to fill completely the abdominal space, we have here a condition of progressively increasing intra-abdominal pressure, which tends to stretch still more the under-developed or weakened abdominal muscles. In this way the belly walls become more and more relaxed, so that the viscera, instead of being supported by elastic muscle, are retained in place chiefly by their attachments. These yield slowly to the strain, and general descent of the abdominal viscera takes place.

In subjects with good fat-making abilities deposits of fat in the omentum frequently act as pads to fill up increased abdominal space furnished by relaxed belly walls, so that descent of the viscera is more or less prevented. We get, then, the protuberant and pendulous abdomen.

The lack of normal abdominal muscle tonus, due to faulty posture, besides directly favoring the ultimate prolapse of the abdominal organs, has an evil influence in still other ways. The stomach and intestines drawing more and more upon their attachments find their circulation interfered with; sharp angles and kinks are formed in the intestinal coils, thus favoring local accumulations of gas and retarding the onward passage, by peristalsis, of the intestinal contents. In this way chronic constipation and various types of indigestion are invited, all of which have a compromising effect upon the health of the individual.

Relation of posture to hernia.—Excluding the case of congenital hernias it is evident that the defective state of development of the abdominal muscles, resulting from bad postural habits, combined with the increased intra-abdominal pressure, may predispose to hernia either because the abdominal wall gives way gradually or ruptures by reason of some sudden muscular strain.

No less than 152 male garment workers, or 7.8 per cent of those examined, were found affected with hernias of various kinds. Nineteen additional individuals, or approximately another 1 per cent, were found who had undergone operations in the past few years for the radical cure of hernia.

In marked contradistinction to the relative frequency of hernia among male workers was its comparative rarity among females, but two of the female workers examined suffering from hernia.

Visceroptosis.—Fifty-four cases of marked visceroptosis among men and 21 cases among women were encountered in the examination, the percentage of incidence being 2.6 per cent for men and 2.1 for women. Sixteen of these subjects, eight men and eight women, had nephroptosis as well, the condition causing marked discomfort and disability. In all the cases of visceroptosis observed the posture was obviously defective.

Relation of posture to flat and weak feet.—A still further relation of faulty posture to the causation of bodily defects lies in the genesis of weak plantar arches and flat feet. We must consider that the displacement of the bones of the feet, resulting in weak arches and flat feet, are not due so much to congenital weakness of the foot structures as to the prolonged action of faulty weight bearing on the feet.

Poor bodily development is, of course, often a factor in the genesis of weak feet, for with defective musculature the posture is only too often apt to be faulty.

A very large number of garment workers were found with weak arches or flat feet. The total number of male workers with this defect was 599, or 29 per cent, while in the case of females the number was 208, or 20.8 per cent. In 185 instances the defect was slight, in 482 cases it was moderate, and in 140 cases it was severe.

Among males the highest percentage of weak or of flat feet in the large groups of workers was found among finishers with 31.4 per cent. Operators came next with 31 per cent and pressers last with an incidence of 24.5 per cent. Among females the highest incidence was found in miscellaneous workers with 26.4 per cent, followed by finishers with 22 per cent and operators with 18.1 per cent.

It should be stated, however, in this connection that, although the number of feet which from an anatomical standpoint were weak or flat was very large, the number of subjects complaining of symptoms was not high, about 91.4 per cent of males with weak or flat feet not complaining, while 8.6 per cent suffered from symptoms. Among females the percentage of those having weak or flat feet complaining of symptoms was considerably higher, 53, or 25. 5 per cent, complaining of symptoms. It is thought that the high-heeled shoes worn by the majority of female workers, with the consequent faulty weight distribution, were partly responsible, at least for the greater percentage of females having flat or weak feet, who complained of symptoms.

Although pressers, as a class, showed the lowest percentage of flat feet among the male workers examined, this is to be expected, as subjects with painful flat feet would ordinarily be deterred from following this occupation by reason of the standing posture it entails. Operators and finishers, on the other hand, would have their efficiency much less compromised by this condition because of their sedentary postures.

Yet the severest cases of flat feet were met with among pressers, as is well shown by figure 13, which gives an example of an extreme case of this deformity encountered in a presser. This subject states that at present he has no pain in his feet, the process of disintegration of the plantar arch having reached its end, but that walking is difficult. In the past, however, he suffered severely.

Effect of faulty shoes.—The effects of faulty posture in causing flat feet is still further increased by defects in the construction of shoes. While the shoes worn by garment workers as a class differed in no way from those worn by the general population, except that some of them with painful feet had gone to large expense in the purchase of so-called orthopedic models, the frequent occurrence of flat feet among garment workers called added attention to the frequency with which shoes as ordinarily sold in shoe stores violate the correct principles of weight bearing. The defects commonly observed were those which tend to throw the weight to the inner side of the sole and heel, crowd the toes, and prevent the proper expansion of the foot as the body weight is transferred to its ball in walking.

Habitual working posture of operators.—Before leaving the discussion of posture some description of the habitual posture of operators at work should be of interest. The chairs provided in shops for the use of operators and finishers are, as a rule, of the ordinary kitchen variety, with saddle, wooden seats. In some instances chairs were not provided, the workers sitting upon an upended box or a rough stool constructed of box lumber. No instances of seats adjustable to height were observed.

Operators, as a class, sit ''on the tips of their spines''; that is, the spine is bowed into an antero-posterior curve. Inasmuch as an individual who sits all day naturally seeks to bear his weight upon the ischial tuberosities, the operator sits on the extreme edge of his chair, so as to bring his weight upon the tuberosities in question, when leaning forward over his work.

It is plain that if the spine is bent in an antero-posterior curve, one must sit on the edge of a chair in order conveniently to bear the weight upon the ischial tuberosities and not on softer and more sensitive structures in the forward leaning position. The antero-posterior curvature of the spine adopted so tilts the pelvis that, unless a position is taken upon the edge of the chair, the weight will not be fully borne upon the tuberosities. On the other hand, if one sits well back in a chair, the back must be kept flat and the spine straight in order to poise the body upon the ischial tuberosities when one leans forward.

In addition to the general effects upon the body of faulty postures which have been previously discussed, a curious local effect of sitting upon the edge of chairs was frequently noted in the case of operators. The concentration of the body weight on the relatively small area overlying the tuberosities produced local changes in the skin. A number of operators were observed with marked thickening and often pigmentation of the skin over the tuberosities. In thin subjects, in several instances, actual callosities were present.

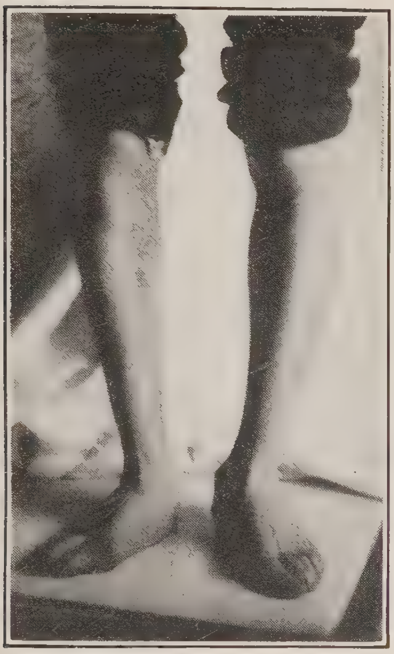

Fig. 13.

Example of severe flat feet in a presser.

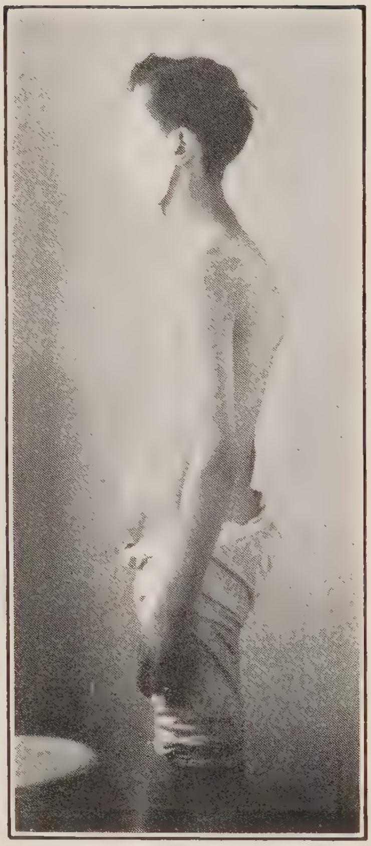

Fig. 14.

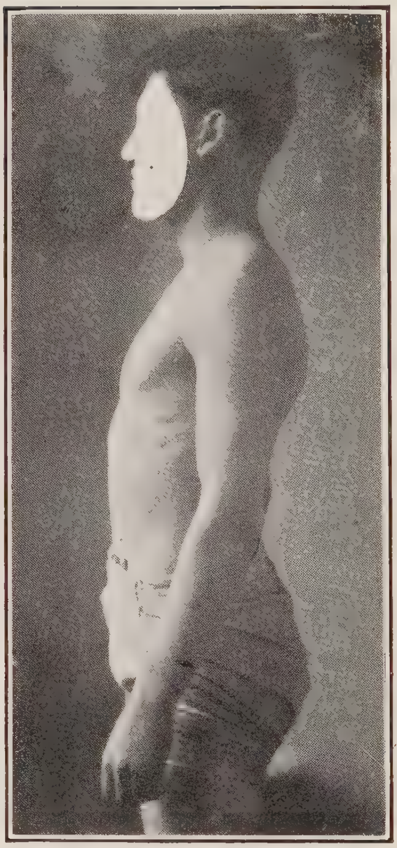

Fig. 15.

Examples of bad and of good posture in youths of the same age (17 years) just entering the garment trades.

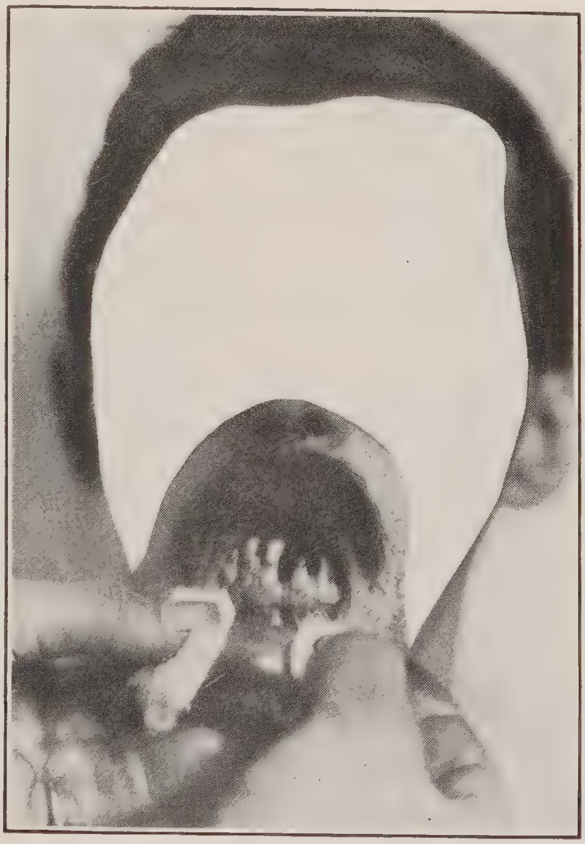

Fig. 16.—Example of extreme neglect of oral hygiene in a garment worker (subject 28 years old).

The garment trades as factors in producing faulty postures.—It seemed plain, from the results of the examination, that, while the garment trades in themselves did not necessarily induce faulty postures, provided the postural habits of the worker were originally correct, occupation in the garment trades had a strong tendency to intensify incorrect postural habits.

The observation that garment workers who, in their youth, had received postural training during military service, for instance, were able to resist the evil postural tendencies of a sedentary occupation throughout an industrial lifetime is, in itself, proof that engagement in such occupations need not, per se, cause faulty postural habits. On the other hand, the effect of the trade upon individuals entering the industry with incorrect postural habits already formed seemed to be marked.

The following two photographs (Plate IV, figs. 14 and 15) seem to be of interest in this connection. Here are two youths, each of the same age, each just entering the garment trades. In the first youth (fig. 14) the protruding abdomen with its tense lower segment, the projecting shoulder blades, forward inclination of the head, relaxed and slender musculature, all indicate a subject with such defective postural habits that he is certain to be adversely affected by a sedentary occupation continued through the years. The other subject (fig. 15), in spite of a slight scoliosis, presents a vigorous musculature for his age (17 years). The scapulæ are flat, the posture active, the erector spinæ muscles well marked. While, through ignorance or carelessness, he may later lapse into a faulty posture, with its attendant ill effects, there is strong ground for hope that his naturally vigorous physique will steer him clear of this error. No such expectation can be entertained with respect to the first youth (fig. 14) unless his present bad posture be corrected by training, before osseous and ligamentary changes shall have rendered his postural defects irremediable.

Defective teeth and pyorrhea alveolaris.—In estimating the state of dentition of the workers examined the following notation was employed in collecting this data. The total number of teeth, sound and unsound, present in the mouth of the individual were counted and this number made the denominator of a fraction the numerator of which was the number of *effective* teeth present. Teeth badly decayed, loose, or wanting in opponents were regarded as ineffective teeth. Thus the notation $\frac{17}{23}$ in regard to the state of dentition of an individual would indicate that while a total of 23 teeth of all degrees of efficiency were present in the mouth only 17 of them were of use to their possessor. The number of persons suffering from defective teeth among garment workers was very large, most of the defects being the result of the neglect of oral hygiene.

Fig. 16 (Plate IV), a photograph of a subject 28 years old, is an extreme example of such neglect.

The teeth were found to be grossly defective in 27 per cent of the men and 24.7 per cent of the women, observations as to the state of the teeth having been made in 1,911 instances in the case of males and 955 instances in the case of females. The total number of teeth present in the mouths of 1,911 males was 51,329 or an average of 26.81 teeth to each person. The total number of teeth present in the mouths of 955 female workers was 27,034, the average number to each female worker being 28.32. Examining now the number of *effective* teeth, the total number of such teeth present, for males was 47,076 or an average of 24.63 to each person, while, for females this total was 25,999 or an average of 27.21 effective teeth to each female worker. The deficiency from normal efficiency was, therefore, 7.37 teeth for males and 4.79 teeth for females. It is seen that on the whole, the teeth of males were more defective than those of females, a result readily accounted for by the greater average age of males, and hence, a longer period of action for the results of the neglect of oral hygiene.

Incidence of pyorrhea.—A large number of cases of pyorrhea alveolaris were also encountered, 480, or 25.7 per cent, of the males and 158, or 16.7 per cent, of the females being so affected. The diagnosis of this affection was based upon the presence of one or more of the following conditions: Loose teeth, presence of pus pockets under the gingival margin, congested, cyanotic and easily bleeding gums, deposits of tartar beneath the gum border, marked recession of the gums.

Recent studies have shown, apart from the indigestion caused by imperfect mastication, the pain, discomfort, and gradual loss of the teeth caused by chronic pyorrhea, that this condition is an important focus of systemic infection. Many observations have now been made of the apparent association of obscure joint affections, neuritic pains and similar conditions with oral sepsis, great improvement in these conditions having occurred when an existing pyorrhea was treated.

Be this as it may, it can not be denied that the presence of pyorrhea in the mouth of an individual constitutes a continuous focus for bacterial infection, which constantly accompanies the individual concerned. While the invasion of the body by hostile germs derived from this source may be put off, perhaps indefinitely, by reason of high natural resistance of the body to infection, the converse is too often the case and infection of the body results.

Apart from this danger, the early destruction of the teeth, the attendant pain and the malassimilation consequent upon diseases of the teeth may, undoubtedly, greatly lessen physical efficiency and be productive of ill health, so that pyorrhea, viewed from any standpoint, must ever be regarded as an important enemy to individual health and efficiency.

It was evident, from the examinations that garment workers, as a class, were but little acquainted with the principles of oral hygiene.

Instances of the regular use of a dentifrice and the tooth brush were seldom encountered.

On the other hand many workers were met with who had spent considerable sums of money for dental work. Thus among females, 13.7 per cent of the workers had crowned teeth, the total number of crowns present being 603 or an average of 4.6 crowns to the worker with crowned teeth.

It should be noted, however, that the kind of dental work done consisted for the most part in crown and bridge work or the supplying of artificial dentures. Prophylactic fillings were conspicuous by their rarity.

In other words large sums had been expended for prosthetic work, when the consistent maintenance of the mouth in a cleanly condition combined with the use of a smaller number of relatively inexpensive and timely fillings might have preserved the teeth in much greater efficiency at a lower cost.

A great deal of the dental work seen among garment workers was evidently done by poorly qualified dental practitioners. Many badly fitting crowns, artificial teeth on saddles without proper support, poorly buttressed bridges and the like were observed, so that, in some instances the last state of the mouth was worse than the first.

Defective vision.—With the exception of the work of the pressers, the garment industry makes exacting demands upon the eyes of the workers. The eyes are used under such conditions that eye strain may easily develop. The necessity for accurate vision is also such that refractive errors should be corrected so as to give maximum acuity of vision and ease in using the eyes.

In the course of this examination all that was attempted was to determine the visual acuity, in the ordinary way, by means of test types, and, when glasses were worn, to estimate the improvement in vision resulting from the glasses.

The test cards were hung in well-lighted parts of the offices, the daylight illumination upon them, by photometric measurement, being never below 29 foot-candles.

The visual acuity was tested in the case of 1,924 males and 982 females, a total of 2,906 persons. Of this number but 743 (502 males and 241 females) had normal vision in both eyes or a little over 25 per cent of the total number tested. In 498 cases (341 males, 157 females), or a little over 17 per cent, the vision was normal in one eye but defective in the other, while in 1,665 instances (1,081 male, 584 female), or about 57 per cent, the vision of both eyes was defective.

Among males, tailors with 13 per cent having normal vision in both eyes showed the lowest percentage of those having normal vision. The percentage of those having normal vision in both eyes in the remaining groups was as follows: Finishers, 19 per cent;

pressers, 24 per cent; operators, 29.1 per cent; miscellaneous workers, 30.4 per cent; cutters, 34.1 per cent. Among females the percentages, by groups, of those having normal vision was as follows: Finishers, 26 per cent; operators, 25.8 per cent; and miscellaneous workers, 28.6 per cent.

Generally speaking the percentage of those having normal vision was in inverse proportion to the age, the groups with the highest average age having the lowest percentage of normal vision.

Considering now the incidence of subnormal vision in both eyes among males, 64.6 per cent of the finishers, 64 per cent of the tailors, 58.7 per cent of the pressers, 52.7 per cent of the operators, 48 per cent of the miscellaneous workers, and 44.6 per cent of the cutters had defective vision in both eyes.

Among females the percentage incidence of defective vision in both eyes was as follows: Finishers, 69 per cent; operators, 57.7 per cent; miscellaneous workers, 57.1 per cent.

From observations in workshops the impression was gained that the work of the finishers entailed greater strain upon the eyes than that of other workers, while the work of pressers made the least demand. It will be shown later in the report that the finisher had often to work under unsatisfactory illuminating conditions. It is significant that the highest percentage of defective vision was encountered in the class of workers who made the greatest use of their eyes.

The following tables show the degree of vision present in the defective eyes of the workers examined:

TABLE 42.—*Degree of defective vision, male garment workers.*

IN 341 WORKERS WITH ONE DEFECTIVE EYE.

Vision less than—	Eyes.	Per cent.	Vision less than—	Eyes.	Per cent.
20/25	82	24.00	20/100	12	3.5
20/30	143	42.00	20/200	8	2.3
20/40	53	15.5	Below 20/200	7	2.0
20/50	16	4.7	Blind	3	0.9
20/70	17	5.0			

IN 1,081 WORKERS WITH BOTH EYES DEFECTIVE.

Vision less than—	Right eye.	Per cent.	Left eye.	Per cent.
20/25	127	11.72	111	10.3
20/30	342	31.6	331	30.6
20/40	216	20.0	219	20.2
20/50	86	8.0	108	10.0
20/70	111	10.3	109	10.1
20/100	96	8.9	99	9.1
20/200	86	8.0	87	8.0
Below 20/200	12	1.1	12	1.1
Blind	5	.45	5	.46

TABLE 43.—*Degree of defective vision, female garment workers.*

VISION OF DEFECTIVE EYE WITH ONE EYE LESS THAN 20/20 (157).

Vision less than—	Number.	Per cent.	Vision less than—	Number.	Per cent.
20/25	1	.64	20/100	2	1.7
20/30	130	82.8	20/200	1	.64
20/40	12	7.6	Light only	1	.64
20/50	4	2.5			
20/70	6	3.8	Total	157	....

VISION OF THOSE HAVING VISION LESS THAN 20/20, BOTH EYES (584).

Vision less than—	Right eye.	Per cent.	Left eye.	Per cent.
20/25	9	1.54	6	1.03
20/30	276	47.2	264	45.2
20/40	106	18.2	123	21.1
20/50	39	6.2	49	8.4
20/70	76	13.0	65	11.1
20/100	32	5.5	25	4.3
20/200	32	5.5	37	6.3
20/200	14	2.4	14	2.4
Fingers only	....	....	1	.17
Total	584	....	584	....

It will be seen from these tables that when the vision in one eye only was defective the deficiency was not great, being between 20/30 and 20/40 in 66 per cent of the males and 91 per cent of the females. When the vision was defective in both eyes it was between 20/25 and 20/30 in approximately 11 per cent of the instances for males and 1.54 per cent of the females; between 20/30 and 20/40 in 31.6 per cent of the males and 47.2 per cent of the females, while in about 58 per cent of the instances for males and 51 per cent for the females with both eyes defective the vision was less than 20/40.

In occupations such as the garment trades, with their exacting demands upon the eye, even small visual defects merit attention. With gross visual defects, the eye makes no effort at compensation by accomodative efforts. Under such circumstances, the fact that his vision is defective may be so obvious to the worker that he seeks relief in glasses.

When small refractive errors are present the worker finds that by concentration he sees well enough for practical purposes, but his efforts to compensate for the refractive error by accommodative efforts lead readily to eye strain with its attendant symptoms.

Use of glasses among garment workers.—In spite of the large number of workers with defective vision, relatively few had made an attempt to improve their vision by the use of glasses. Only 254 persons, 132 males and 122 females, or about 11.7 per cent out of a total of 2,163 male and female persons with defective vision, wore glasses. Of these 254 persons wearing glasses, in only 51 cases or about 20 per cent was the visual defect wholly corrected by the glasses worn. Partial correction of the visual defect was present in 163 cases, or about 64 per cent of those wearing glasses, while in 36 cases, or about 14.4 per cent, the glasses worn either did not improve the vision or made it worse. In 4 cases, or 1.58 per cent, glasses had been procured but were not worn. Compared with the total number having defective vision these percentages become smaller yet, those with defective vision having their defect fully corrected by glasses being but 2.35 per cent, those with the defect partly corrected being 7.5 per cent, and those wearing glasses without improvement being 1.67 per cent. A part, at least, of the poor results derived from the use of glasses among garment workers arose from the fact that too often the glasses were prescribed by opticians or poorly qualified practitioners. In other instances the type of visual error was such that partial correction was the best that could be secured.

It is evident from the foregoing that a large proportion of garment workers suffer from visual defects, while the use of correcting glasses is very much less than it should be, considering the number requiring their use. It is also evident, with the exception of pressers, that the occupation is one making exacting demands upon the eyes, the corollary being that eyes of these workers should be used under conditions promoting visual ease and acuity. It is needless to say that the use of properly fitted glasses to correct even small visual defects is, for eye workers, an important part of the hygiene of the eye.

Menstrual disorders.—A considerable proportion of the female workers examined suffered from menstrual disorders. Four, or 0.4 per cent, suffered from amenorrhea not due to the menopause. Menstruation was delayed in 10, or 1 per cent; irregular menstruation was present in 22, or 2.2 per cent; menorrhagia was present in 31, or 3.1 per cent; while 202, or 20.2 per cent, suffered from dysmenorrhea.

Nervous affections.—Attention has been called by Schwab [1] to the high rate of prevalence of neurasthenia among garment workers. Data upon this point are therefore of interest. Among 3,086 individuals there were 239 cases of nervous affections, of which 207 were in males and 32 in females, a rate of prevalence for each sex of approximately 10 per cent and 3.2 per cent, respectively. The following table gives the nature of these affections and the number of each sex affected. In some instances the disease or condition causing the symptoms could not be determined, for which reason only the symptoms present are included in the list:

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[1] Schwab, S. I.: Neurasthenia Among Garment Workers. American Labor Legislation Review, New York, 1911, vol. 1, pp. 27–33.

TABLE 44.—*Nervous affections in garment workers.*

Disease.	Males.	Females.
Anesthesia of skin of chest	1	....
Atrophy, muscular, progressive	2	....
Atrophy, muscles of legs (hyst. paralysis)	....	1
Defective speech (stuttering)	8	1
Dermographia	2	....
Epilepsy	1	....
Hysteria	....	6
Impotence	15	....
Metatarsalgia, Morton's	1	....
Migraine	....	3
Neurasthenia	89	8
Neurasthenia, sexual	2	....
Neuritis	12	6
Occupational pains	57	4
Paralysis agitans	1	....
Paralysis of facial nerve	2	....
Paralysis of recurrent laryngeal nerve	2	1
Paraplegia	1	....
Premature ejaculation	4	....
Psychasthenia	4	....
Reynaud's disease	1	....
Spasm of leg, muscular	....	1
Tabes dorsalis	2	....
Urticaria	....	1
Total	207	32

In addition to those just tabulated there were a considerably larger number who presented no definite condition which could be diagnosed, but gave a strong impression of being predisposed to neuropathic affections. Of the nervous affections encountered neurasthenia was by far the most prevalent, 89 male workers presenting well-marked clinical pictures of neurasthenia. In addition to these, 5 presented marked symptoms of psychasthenia, thus making a total of 94. Among females the number subject to neurasthenia was but 8.

Among males, pressers (who constituted approximately one-third of those examined) had only about 10 per cent of the total number of cases of neurasthenia, while over 89 per cent of the cases found were in the operator and finisher groups. Now, apart from the nature of their work, which entails considerable muscular exertion in the standing posture, the chief economic difference between pressers, operators, and finishers lies in the fact that while pressers are paid on a weekly basis the latter two classes are paid by the piece.

Although all garment workers are more or less subject to the seasonal fluctuation in activity which characterizes the garment trades, the earnings of operators and finishers are influenced to a large degree by personal skill and celerity, a condition not present in the case of week workers. There are two factors, generally speaking, which tend to cause overstrain among pieceworkers in the garment trades, hence especially operative for operators and finishers. First, the temptation to overspeed for the purpose of earning high wages when work is brisk, followed by a period of inactivity in the slack season, during which time is afforded for introspection, consideration of the future, worry as to whether work will be forthcoming during the next season, depression over the present bad season, and similar concepts. While, undoubtedly, in the case of pressers these thoughts must also be present to a certain extent, pressers, on the whole, seem to be a stolid and rather philosophical group of workers. Operators, on the other hand, who to be successful must exhibit skill, speed, and concentration, are likely to be more intelligent and of a high-strung, imaginative temperament, while in the case of finishers, though as a class inferior to operators in intelligence, the high percentage of married workers, combined with their low rate of pay and the generally large families dependent upon them, must produce a strong incentive to overspeed during the busy season, which, followed by the reaction of the idle period, may well be productive of stress and strain.

Occupational pains.—Next to neurasthenic and psychasthenic conditions, the condition about to be described, for want of a better term, under the name of "occupational" pains, seemed the most common nervous affection observed. These were present in 2.73 per cent of the workers examined. This condition consisted briefly of pain or discomfort usually referred to one or all of the following locations: First, a sensation of numbness and tingling over the seventh cervical vertebra, radiating thence upward to the occiput; second, an aching pain in the shoulder girdle just below and internal to the acromial end of the clavicles; third, pains and aching between the shoulder blades; and, fourth, an indefinite pain just below the tip of the sternum. No physical signs could be found, in most cases, to account for these pains. In six cases it was thought that an osteoarthritis of the spine in the region of the seventh cervical and first or second dorsal vertebræ might be present. At least, the spinous processes seemed unduly prominent in this situation, and there seemed to be some thickening of the overlying structure. No pain, however, was present on pressure or percussion.

In the opinion of the writer, these pains were postural in character and were the result of tense, continuous work in a faulty position.

Nose and throat affections.—The great frequency with which pathological conditions of the nose and throat are encountered among garment workers has already been mentioned in connection with defects of the hearing. Deflected nasal septum was encountered 253 times, or in 10.4 per cent of the males and 3.6 per cent of the females; hypertrophy of the tonsils 472 times, or in 12.8 per cent of males and 20.4 per cent of females; pharyngitis and nasopharyngitis 480 times, or in 18.2 per cent of males and 9.9 per cent of females; while atrophic or hypertrophic rhinitis was present 810 times, or in 29.3 per cent of males and 19.8 per cent of females. It can not be said that the garment trades, per se, were responsible for the great frequency of these affections, as they were encountered without reference, apparently, to the length of time the worker had been engaged in the industry. Moreover, the state of development of the palate and dental arches and the lack of development of the nasal chambers showed, in many instances, that the condition had existed from childhood.

It must be remembered that the large majority of the workers had always been city dwellers, hence doubtless exposed from birth to the influence of crowded and congested quarters, said to favor the occurrence of chronic catarrhal conditions of the nose and throat.

With such conditions so common among garment workers, the relation of their occupation to the causation and course of chronic nose and throat affections becomes of interest. Conditions of temperature and relative humidity are important meteorological factors in their effects upon the respiratory passages. Thus, the great majority of garment workers who suffered from chronic nasal affections stated that these, as a rule, were much better in the summer than in the winter.

Undue dryness of the air of interiors, due to insufficient humidification, is one of the conditions present, as a rule, in the winter in American homes, schools, and office buildings which is said to aggravate existing nasal and throat affections. The average condition of temperature and relative humidity in the winter in shops of the garment trades is, therefore, of importance with respect to the prevalence of chronic catarrhs of the nose and throat among garment workers.

As this investigation took place during the summer, it was of course impossible to make direct observations on these points in the cold weather. The results of some 300 observations as to temperatures and relative humidities in workshops of the women's garment industry made during the summer show that, while in many instances the temperatures in workshops were higher than outdoor temperatures the relative humidities were, on the whole, but slightly different from those of the exterior. Rogers,[1] however, in an investigation of the ventilation of cloak and suit shops in 1911, during the months of February, March, and the first part of April, made 447 observations of the dry and wet bulb temperatures in workshops of the cloak and suit trades as follows: Modern loft buildings, with steam heat, 244 observations; old type loft buildings, heated by stoves, 138 observations; converted tenement houses, stove heat, 30 observations; converted dwellings, stove heat, 23 observations; cellar shops, stove heat, 12 observations. These temperatures have been averaged by the writer and the average relative humidities determined with the results as set forth in the table following.

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[1] Ventilation of Cloak and Suit Shops, Special Report by C. T. Rogers, M. D., medical factory inspector, Department of Labor, New York City, First Annual Report of the Joint Board of Sanitary Control, p. 73.

TABLE 45.—*Average dry and wet bulb temperatures and relative humidities in shops of the garment trade.*

[Based on Rogers's data.]

Type of shop and time of year.	Number of shops.	Number of observations.	Type of heating.	Average dry-bulb temperature.	Average wet-bulb temperature.	Average depression.	Average relative humidity.
				°F.	*°F.*	*Degree.*	*Per cent.*
Modern loft building, February-April.	44	244	Steam-heat.	64.34	53.35	10.74	50
Old-type loft building, February-April.	43	138	Stoves	61.2	52.3	8.9	54
Converted tenement, March-April	8	30	...do...	61.9	52.3	9.6	52
Converted dwelling, March-April	7	23	...do...	64.52	56.4	8.12	60
Cellar shop, April	3	12	...do...	64.0	52.3	11.7	52.3
General average	105	447		63.2	54.4	9.8	52

It will be seen from this table that the average dry-bulb temperature in 105 shops was 63.2° F., and the average wet-bulb temperature was 53.4° F. This corresponds to an average relative humidity of 52 per cent. This is by no means low and is probably well in excess of the average relative humidity prevalent in many dwellings during the winter months. Indeed there are a number of sources of moisture in workshops not operative in the home. A certain amount of water vapor is derived from the combustion of gas in gas jets and pressing irons; a number of filled fire buckets are present in various locations; moisture is generated from damp pressing cloths and also exhaled from the workers. All of these tend to keep the air fairly moist. It is also seen from the table that, while the relative humidities are not low, the dry-bulb temperatures are by no means high. In fact in some shops heated by stoves the dry-bulb temperatures were too low, being below 60° F. in a number of instances. Under such circumstances catarrhal conditions might be made worse in sedentary workers, coldness of the hands and feet tending to cause congestion of the nasal mucous membranes.

While the average relative humidity from Rogers's data was found to be over 50 per cent, his figures were examined further for the occurrence of low relative humidities.

The following table shows for 427 observations the distributions of the relative humidities observed:

TABLE 46.—*Distribution of relative humidities, shops of the garment trades.*

[Rogers's data.]

Relative humidity (per cent).	Number of instances.	Per cent.	Relative humidity (per cent).	Number of instances.	Per cent.
14 to 19	4	0.93	60 to 64	56	13.10
20 to 24	8	1.86	65 to 69	39	9.13
25 to 29	17	3.99	70 to 74	22	5.15
30 to 34	29	6.8	75 to 79	21	4.91
35 to 39	44	10.3	80 to 84	3	.71
40 to 44	42	9.82	85 to 89	1	.23
45 to 49	46	10.75	90 to 94	1	.23
50 to 54	54	12.65			
55 to 59	42	9.82	Total	427	

It will be seen from that table that the relative humidity was below 50 per cent in 190 cases, or 44.5 per cent; below 45 per cent in 144 instances, or 33.75 per cent; below 40 per cent in 102 instances, or 23.9 per cent; and below 30 per cent in only 29 cases, or 6.8 per cent.

It would seem, therefore, so far as the observations of others are concerned, considered only from the standpoint of relative humidity, the air of clothing shops is by no means so deficient in moisture as one might be led to suppose.

Suspended matter in the air.—There is, however, another condition, inseparable from the garment trade that is capable of having an untoward effect upon the mucous membranes of the nose and throat. The constant handling of woolen materials gives rise to a certain amount of small fuzzy particles or ''fly'' which may be present to a considerable extent in the air of workshops in this industry. It is probable that the vibration of the machines, extending to the floor, is also a factor in preventing these particles from settling.

The amount of suspended matter in the air is likewise dependent, to a certain extent, upon the prevailing styles. When these are such as to call for the use of loosely woven, soft fabrics the amount of ''fly'' is apt to be greater than when hard, closely woven materials are in demand.

The effect of such soft, woolly materials upon the atmosphere of workshops was well illustrated, during the course of making photometric measurements in shops of the trade.

In one instance, where a number of cloaks were being made up of imitation fur (a very woolly material), it was frequently necessary to wipe off the test plate of the photometer because the accumulation of woolen particles upon its surface interfered with the accuracy of the measurements.

The nasopharyngeal affections noted among garment workers seem to be a source of considerable annoyance to them. They frequently visit dispensaries on account of these conditions. Seventy-five males and fifty-two female workers reported to the examiners that they had undergone nasopharyngeal operations for the relief of such conditions.

Trachoma.—In view of the fact that trachoma is prevalent in those parts of Europe from which the majority of garment workers come, because recent investigations of the Public Health Service have shown this disease to be very prevalent in certain sections of the United States, and finally, because the figures published by investigators in the New York City Department of Health show that the disease is not infrequent in the New York City public schools, special care was taken to determine the prevalence of trachoma among the garment workers examined. The eyelids of each individual were everted and the superior and inferior cul-de-sac inspected.

As a result of this inspection, eight cases of active trachoma were found among males and none among females. This is a rate of prevalence, for the numbers examined, of 2.6 cases per 1,000, a rate of prevalence, which, according to Boldt, must be regarded as rather low.

In addition to this six males and two females were observed who showed the lesions of a previous attack of trachoma, but the disease was at present cured. It would seem, as a result of the examination, that the measures employed by the Public Health Service to prevent the landing of aliens suffering from trachoma have been reasonably effective.

Tuberculosis.—Tuberculosis is undoubtedly the most important and serious disease from which garment workers suffer. There were 74 cases of tuberculosis found among the workers examined, of which 65 were among the males and 9 among females. This corresponds to a rate of prevalence for each sex of 3.11 per cent and 0.9 per cent, respectively. Tuberculosis was, therefore, found to be over three times as prevalent among the males as among the females. Of the 74 cases of tuberculosis, 68 were cases of pulmonary tuberculosis, 4 cases of tubercle of lymph glands, 1 of tubercle of the larynx, and 1 of tubercle of the testicle.

In addition to the cases of active tuberculosis there were 29 persons, 22 male and 7 female, who, from their previous history and the physical signs present, had formerly suffered from tuberculosis, the process being arrested at the time of the examination. In 29 additional cases, 20 male and 9 female, tubercle of the lungs was suspected, but no positive diagnosis could be made.

It should be stated that in the case of those definitely stated to be tuberculous, in a number of instances the diagnosis was made as the result of several examinations of the subject who returned to the office for this purpose. In other instances the disease was so well advanced that the diagnosis was obvious.

It would seem that tuberculosis was unduly prevalent among garment workers, especially among males. The rate of prevalence among these is nearly ten times that of the United States Army, for instance, and in the case of females the rate of prevalence is nearly three times. Among males, finishers and pressers showed the highest incidence of tuberculosis, with a percentage of incidence of 4.64 and 3.76 per cent, respectively. In operators, the incidence was 2.38 per cent; in tailors, 1.85 per cent; in cutters, 2.09 per cent. Among females the rate of prevalence was as follows: Finishers, 1.61 per cent; operators, 0.8 per cent; miscellaneous workers, 0.53 per cent.

The disease was, therefore, the most prevalent in the groups earning the lowest wages and having the greatest number of persons dependent upon them.

It is perhaps significant that among males these groups had the largest average families, the smallest average number of rooms in their homes, and, consequently, the greatest average number of occupants per room. These groups also had the highest percentage of persons with bad postures.

It is thought that the incidence of this disease, as determined by the examination, may have been artificially raised, in that some of the workers, suspecting their condition, came to be examined for the purpose of finding out whether they were the subjects of tuberculosis. On the other hand, in a number of instances the worker was ignorant of his condition, having been aware, on being questioned, only of a gradual failure of health.

It seems reasonable to suppose that the great difference in the prevalence of the disease among males and females may be due to the following causes: The males followed the garment trades as a permanent means of livelihood, whereas in the case of females occupation in the industry seemed temporary. The average age of the males exceeded that of the females by 10 years, and the average time in the industry was nearly 10 years, about twice that of the females. In addition some 75 per cent of the males were married, whereas but 13 per cent of the females were married or had been married. This means that the males had others dependent upon them in the majority of instances, while the females were able to devote in all probability a greater proportion of their earnings to themselves. In the case of the males, therefore, there may be postulated peculiar elements of stress and responsibility which were not operative for females. In their effort to provide for those dependent upon them the males would be more likely to reduce their personal expenditures for necessaries to a minimum, and in this way a diminished resistance to the disease would be produced through an insufficient diet and inadequate clothing. In addition to this, the necessity for earning the greatest possible wage in order to tide over the dull season would, especially in the case of pieceworkers, lead to unusual exertion, so that in the case of males we have an added element of overstrain which in itself would predispose to acquiring tuberculous infection by diminishing vital resistance.

Valvular disease of the heart.—Valvular disease of the heart was fairly common among garment workers, 60 cases being observed, of which 37 were among males and 23 among females. The rate of prevalence was 1.79 per cent and 2.3 per cent among males and females, respectively. In the majority of instances good compensation was present, the subject being unaware that his heart was affected.

Owing to the sedentary nature of the garment industry the effect of this trade upon valvular lesions is unimportant. With proper care a majority of garment workers with well-compensated valvular defects might escape material shortening of their period of efficiency while engaging in their particular industry.

In view of the fact, however, that many of the workers affected with valvular disease of the heart were unaware of the condition, it is evident that knowledge on their part of their defect is desirable so that by practicing the proper precautions as to personal care and hygiene, the compensation of the defect might be maintained and its breaking down avoided through unnecessary muscular stress and neglect of personal hygiene. It follows that all garment workers in whom valvular defects were found in the course of the examination were informed of their condition and proper advice furnished them.

Varicose veins.—Eighty-five of the workers examined, 62 males and 23 females, suffered from varicose veins of the legs. The incidence was 3 per cent in males and 2.3 per cent in females. Forty-five, or about 72 per cent, of the cases among males occurred in pressers, the actual incidence among this group being 6 per cent, as compared to an incidence of 1.2 per cent in the remaining workers. Among females, on the other hand, the maximum incidence was among finishers, 5.3 per cent. Female finishers were, however, older by two years on the average than other female workers and contained a greater proportion of married women (10 per cent). Many of the varicose veins among females were the result of previous pregnancies.

Among males varicose veins were five times as prevalent among pressers, who work standing, as among the sedentary workers.

The accompanying photograph (Plate V, fig. 17) shows the type of varicosities frequently encountered:

Venereal diseases.—In view of the fact that considerable attention has been recently paid to the incidence of venereal disease in the general population, and that a number of societies have been formed to combat its prevalence, it was evident that data as to the prevalence of venereal diseases among garment workers would be of value.

Previous venereal history was accordingly obtained in the case of 550 male workers, viz, 275 operators, 185 pressers, 54 finishers, 12 cutters, 12 tailors, and 8 miscellaneous workers. These willingly furnished the information.

From these histories it appears that 411, or 75 per cent, denied ever having suffered from any venereal disease, while 139 stated that in the past they had suffered from such diseases. The disease was stated to be gonorrhea in 122, or 87 per cent; soft chancre in 15, or 10.8 per cent; and syphilis in 2, or 1.4 per cent, of the cases.

Gonorrhea, still active, was found in 16 out of the 139 cases admitting a previous venereal infection. In addition to two subjects admitting a previous syphilitic infection who, at the time of the examination,

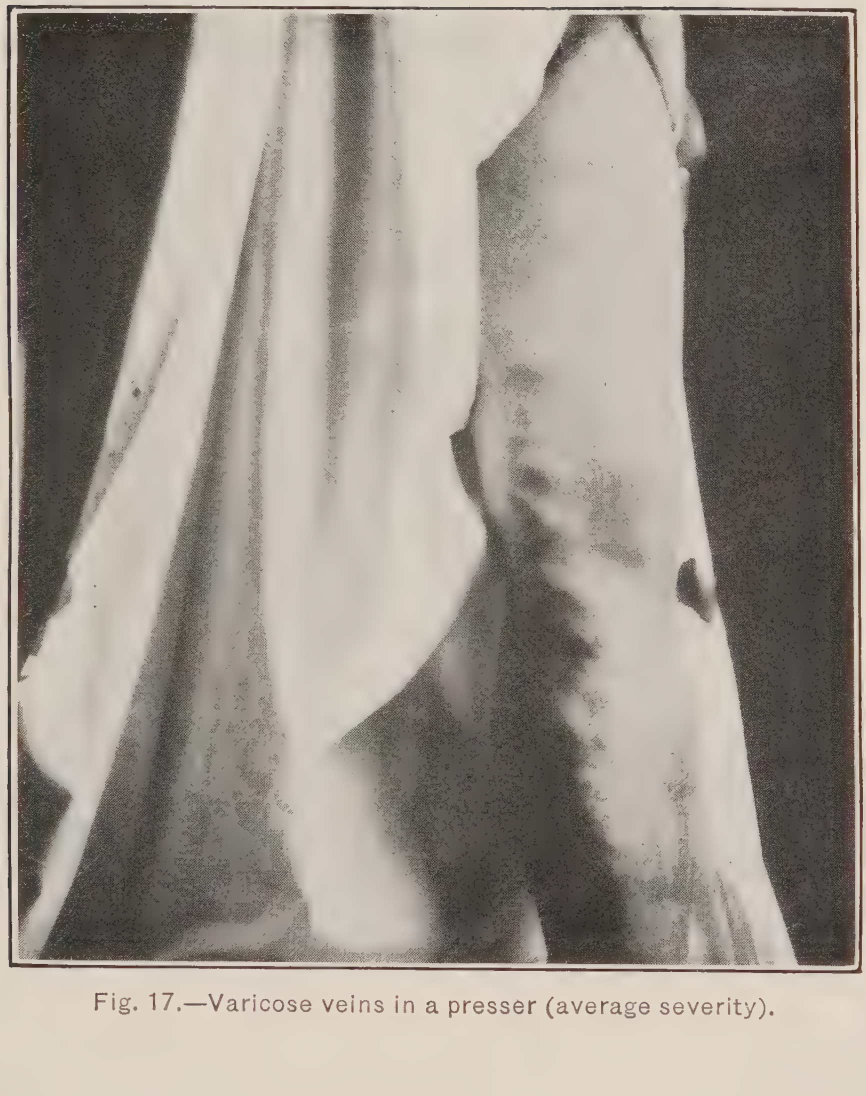

Fig. 17.—Varicose veins in a presser (average severity).

were suffering from locomotor ataxia, two cases of active syphilis were observed, one showing a partially healed primary lesion and recent secondaries, the other with a rupial eruption.

Results of blood tests.—In order to ascertain the rate of prevalence of syphilis by serological methods, 259 specimens of blood were obtained and tested by the Wassermann reaction, at the Hygienic Laboratory, Washington, D. C., for the presence of syphilitic antibodies. While, as a rule, blood specimens were obtained from those admitting previous venereal infection of some kind, an effort was made to have the group furnishing blood specimens as nearly representative as possible of the general group examined.

It should be stated, however, in the case of blood specimens obtained from persons with a previous venereal history, that in no case of those admitting previous gonorrheal infection only was the Wassermann reaction positive.

Syphilitic antibodies were present in 3, or 1.16 per cent, of the sera examined and absent in the remainder. One of these 3 cases was the instance above referred to with the secondary eruption, one was a case of locomotor ataxia, and one subject who gave a positive reaction denied previous infection.

While gonorrheal infection, therefore, was not uncommon among male garment workers, it is seen that syphilis is apparently rare.

THE SUBJECTIVE STATE OF HEALTH OF GARMENT WORKERS.

The subjective state of health of garment workers was hardly satisfactory. Each person examined was questioned as to his previous and present state of health, and asked to state any complaints he might have as to his well-being. Nine hundred and thirty-five individuals, or 30.3 per cent, had no fault to find with their present state of health, while 2,157, or 69.7 per cent, complained of not feeling perfectly well. Among males, 1,400, or 67.1 per cent, had complaints, while 686, or 32.9 per cent, had none. Among females there were 751, or 75.1 per cent, with complaints, while 249, or 24.9 per cent, said that they felt well.

The table following gives the character of the complaints made by males and females, the number of each kind of complaint, and the percentages for each sex and for all examined.

TABLE 47.—*Complaints of garment workers.*

Complaint.	Males.	Females.	Total.	Per cent.		
				Males.	Females.	Tota
Agoraphobia	2	....	2	0.1	....	0.0
Amnesia	1	....	1	.05	....	.0
Anosmia	1	....	1	.05	....	.0
Anorexia	119	57	176	5.7	5.7	5.7
Anxiety	2	2	4	.1	.2	.1
Asthmatic attacks	12	....	12	.58	....	.4
Backache	67	28	95	3.21	2.8	3.0
Bad taste in mouth	13	20	43	.62	2.0	1.3
Belching	9	17	26	.43	1.7	1.2
Bloody stools	6	....	6	.29	....	.1
Bulimia	....	1	1	....	.1	.0
Capricious appetite	4	10	14	.19	1.0	.4
Chilly sensations	1	1	2	.05	.1	.0
Choking sensations	7	....	7	.33	....	.2
Cold extremities	1	4	5	.05	.4	.1
Constipation	466	268	734	22.4	26.8	23.7
Constriction in chest	4	....	4	.192	....	.1
Constriction in throat	2	1	3	.95	.1	.2
Cough	229	21	250	10.9	2.1	8.1
Cramps, abdominal	21	5	26	1.0	.5	.8
Cramps of legs	1	4	5	.05	.4	.1
Creaking of joints	1	....	1	.049	....	.0
Crying spells	....	1	1	....	.1	.0
Deafness	19	7	26	.91	.7	.8
Deficient erections	7	....	7	.33	....	.22
Difficulty in swallowing	1	....	1	.049	....	.03
Difficulty in urination	1	....	1	.049	....	.03
Dimness of vision	9	10	19	.43	1.0	.61
Discomfort, abdominal	17	....	17	.815	....	.55
Discomfort in chest	1	....	1	.049	....	.03
Discomfort, epigastric	11	4	15	.54	.4	.47
Distension, abdominal	7	3	10	.33	.3	.32
Distress, precordial	20	12	32	.96	1.2	1.03
Diarrhea	10	....	10	.48	....	.32
Dizziness	24	105	129	1.1	10.5	4.17
Dryness of mouth	1	....	1	.049	....	.03
Dryness of nose	....	2	2	....	.2	.65
Dryness of throat	4	5	9	.192	.5	.29
Dysmenorrhea	....	200	200	....	20.0	6.5
Dyspnoea on exertion	62	32	94	2.97	3.2	3.1
Epistaxis	2	....	2	.96	....	.65
Excitability	1	6	7	.049	.6	.22
Fainting	2	9	11	.196	.9	.35
Fever	6	....	6	.287	....	.19
Formication	4	1	5	.192	.1	.89
Frequent colds	15	49	64	.72	4.9	2.7
Frequent nocturnal emissions	9	....	9	.43	....	.29
Frequent sighing	2	....	2	.196	....	.065
Frequent urination	14	6	20	.67	.6	.65
Furunculosis	1	....	1	.049	....	.032
Globus hystericus	1	5	6	.049	.5	.194
Hallucinations	1	....	1	.049	....	.032
Headaches, frequent	207	242	449	9.9	24.2	14.5
Headache, occasional	62	39	111	2.96	3.9	3.6
Heartburn	16	14	30	.765	1.4	.97
Hemeralopia	2	....	2	.096	....	.065
Hemoptysis (all grades)	14	....	14	.67	....	.455
Hoarseness	33	11	44	1.58	1.1	1.45
Hot flushes	....	2	2	....	.2	.065
Hyperesthesia of scalp	1	....	1	.049	....	.032
Hysterical attacks	....	9	9	....	.9	.291
Impotence	15	....	15	.72	....	.485
Incontinence of urine	1	1	2	.049	.1	.065
Indigestion	37	25	62	1.77	2.5	2.0
Insomnia	84	20	104	4.01	2.0	3.37
Irritability	6	17	23	.287	1.7	.745
Irritation of throat	1	....	1	.049	....	.032
Lassitude	42	58	100	2.3	5.8	3.23
Loss of weight	89	....	89	4.25	....	2.88
Mental confusion	2	....	2	.096	....	.065
Mental depression	15	7	22	.72	.7	.711
Meteorism	2	....	2	.096	....	.065
Muscae volitantes	2	....	2	.096	....	.065
Nasal obstruction	82	24	116	3.93	3.4	3.76
Nausea	4	23	27	.193	2.3	.875
"Nervousness"	61	17	78	2.92	1.7	2.52
Neuralgia	4	4	8	.193	.4	.258
Night sweats	25	....	25	1.195	....	.81

TABLE 47.—*Complaints of garment workers*—Continued.

Complaint.	Males.	Females.	Total.	Per cent.		
				Males.	Females.	Total.
Numbness of back	1	....	1	0.049	....	0.032
Numbness of extremities	11	1	12	.525	0.1	.388
Numbness of feet	11	....	11	.525	....	.356
Overaction of heart	2	....	2	.096	....	.065
Pain:						
Abdominal	21	21	42	1.1	2.1	1.36
In ankles	1	....	1	.049	....	.032
Arms	15	9	24	.72	.9	.775
Bearing down	....	1	1	....	.1	.032
Breast	6	....	6	.287	....	.194
Chest	171	18	199	8.2	1.8	6.45
Clavicles	1	....	1	.049	....	.032
Ear	1	3	4	.049	.3	.129
Epigastrium	56	72	128	2.68	7.2	4.15
Eyes	8	4	12	.383	.4	.389
Face	1	....	1	.049	....	.032
Feet	37	14	51	1.77	1.4	1.65
General, indefinite	18	5	23	.86	.5	.794
Girdle	1	....	1	.049	....	.032
Groin	1	....	1	.049	....	.032
Hand	3	....	3	.144	....	.097
Heel	2	....	2	.096	....	.065
Hip	4	2	6	.193	.2	.194
Hypochondrium	9	....	9	.43	....	.291
Hypogastrium	5	1	6	.239	.1	.194
Iliac fossa—						
Left	3	1	4	.147	.1	.13
Right	13	14	27	.62	1.4	.875
Joints	4	....	4	.193	....	.13
Knees	4	....	4	.193	....	.13
Legs	82	39	121	3.92	3.9	3.92
Lumbar region	47	1	48	2.25	.1	5.51
Muscles	5	14	19	.24	1.4	.615
Neck	5	....	5	.24	....	.162
Nose	6	....	6	.277	....	.194
Perineum	1	....	1	.049	....	.032
Rectal	1	....	1	.049	....	.032
Shoulder	39	8	47	1.87	.8	1.52
Shoulder blades, between	35	....	35	1.67	....	1.13
Side, left	1	1	2	.049	.1	.065
Spine	5	1	6	.24	.1	.194
Tendo Achilles	1	....	1	.049	....	.032
Testicles	1	....	1	.049	....	.032
Throat	1	....	1	.049	....	.032
Wrist	1	....	1	.049	....	.032
Painful defecation	18	10	28	.872	1	.906
Painful micturition	8	4	12	.383	.4	.389
Palpitation of heart	18	35	53	.872	3.5	1.73
Polyuria	2	....	2	.096	....	.065
Premature ejaculation	4	....	4	.193	....	.13
Pressure in head	1	....	1	.049	....	.032
Profuse perspiration	12	5	17	.575	.5	.55
Pruritus	12	....	12	.575	....	.389
Pruritus vulvæ	....	1	1	....	.1	.032
Regurgitation of food	8	....	8	.393	....	.259
Running ears	6	....	6	.287	....	.194
Salivation	1	....	1	.049	....	.032
Sensation:						
Foreign body in throat	1	....	1	.049	....	.032
Pricking in throat	2	....	2	.096	....	.065
Tickling in throat	11	1	12	.526	.1	.389
Singultus	2	....	2	....	.2	.065
Somnolence	3	3	6	.144	.3	.194
Sneezing, constant	1	....	1	.049	....	.032
Sore throat	15	6	21	.72	.6	.68
Stiffness of hands	3	....	3	.144	....	.098
Swelling of—						
Ankles	1	2	3	.049	....	.098
Feet	3	....	3	.144	....	.098
Glands of neck	2	....	2	.096	....	.065
Legs	2	....	2	.096	....	.065
Tenderness, abdominal	1	11	12	.049	....	.032
Thirst, excessive	5	....	5	.239	....	.162
Thumping in head	1	....	1	.049	....	.032
Timidity	1	1	2	.049	.1	.065
Tinnitus aurium	12	7	19	.575	.7	.615
Toothache	2	....	2	.096	....	.065
Tremor	13	....	13	.622	....	.42

TABLE 47.—*Complaints of garment workers*—Continued.

Complaint.	Males.	Females.	Total.	Per cent.		
				Males.	Females.	Total.
Uncontrollable laughter		1	1		0.1	0.032
Vomiting	13		13	0.622		.422
Wasting of muscles	1		1	.049		.03
Weakness, general	137	40	177	6.57	4	5.74
Weakness of—						
Arms	9		9	.43		.29
Heart	1		1	.049		.032
Legs	45		45	2.15		1.45
Total	2,360	1,775	4,135			
No complaints	686	249	935	32.9	24.9	30.3
Having complaints	1,400	751	2,151	67.1	75.1	69.7
Average number of complaints to person complaining	1.69	2.36	1.92			

From this table it appears that there were 4,135 complaints of all kinds, 2,360 by men and 1,775 by women. The average number of complaints to each person complaining was 1.69 complaints for males and 2.36 complaints for women. The most frequent complaint was pain of some kind (626 complaints of pain on the part of men, 229 for women) followed by complaints of constipation (22.4 per cent of men and 26.8 per cent of women), dysmenorrhea (20.2 per cent of women), frequent headaches (10 per cent of men and 24.2 per cent of women), weakness (5.74 per cent of both sexes).

SUMMARY OF THE INVESTIGATION AS TO THE HEALTH OF GARMENT WORKERS.

This investigation as to health of garment workers was undertaken at the request and with the cooperation of the Joint Board of Sanitary Control of the Cloak, Suit and Skirt, and Dress and Waist Trades of New York City. It constitutes the first of a series of studies to be made, as facilities permit, by the Public Health Service, as to the health of workers and the prevalence of occupational diseases in various important industries. The persons whose condition of health was examined in this investigation were workers in the cloak and suit and dress and waist industries in which approximately 86,000 individuals are employed in New York City. Of these, about 49,000 are employed in the cloak, suit, and skirt industry and 37,000 in the dress and waist industry. Eighty-seven per cent of the workers are males in the cloak and suit trades, while 77 per cent are females in the dress and waist trades.

The scope of the investigation, so far as the health of the workers was concerned, consisted in the careful physical examination of some 3,000 persons, 2,000 males and 1,000 females, with a view to recording physical data, the incidence of defects and diseases, the present subjective state of health, and certain social data. The investigation met with the approval of the unions of these industries, who assisted in disseminating information among the workers as to the scope and purpose of the investigation. Special offices were used for conduct of the examinations.

In addition to the inquiry as to the state of health of workers in these industries, collateral investigations were made as to the hygienic conditions of illumination in workshops of the trades, the effect upon the atmosphere of workshops of the general sanitary conditions in shops of the trades, studies of the environment of workers outside the shop.

The results of the survey as to conditions of illumination appear and are summarized in the second portion of this report. The results of the other investigations will be the subjects of subsequent reports.

Summary of the observations as to the physical status and health of garment workers.—One thousand females and a little over two thousand males were examined. Practically all the males were workers in the cloak, suit, and skirt trades, while some 86 per cent of the females were engaged in the dress and waist trades.

The type of physical examination made was thorough, 45 to 50 minutes being spent upon each individual. Besides collecting certain social and economic data, observations were made as to height, weight, circumference of chest, abdominal circumference, vital capacity, strength of grip, evidence of protection by vaccination against smallpox, pelvic measurements (in females), the systolic and diastolic blood pressure, the pulse rate, the percentage of hemoglobin.

In addition the present physical status was carefully investigated, due note being made of defects and diseases present. In males the urine was also examined for the presence of albumen and sugar, and in 259 instances blood specimens were tested for the presence of syphilitic antibodies.

Male workers in the cloak and suit trades are divisible into the following groups: Cutters, who cut out the material; operators, who sew the garments together on electrically driven sewing machines; finishers, who apply the finishing touches by hand; pressers, who press the garments; and miscellaneous workers engaged in various other operations, such as buttonhole making, draping, and the like.

Females were classified into but three groups of workers, i. e., operators, finishers, and miscellaneous workers. Their duties are similar to the corresponding groups in the cloak and suit trades.

There were two main differences in these groups of workers, one economic and the other postural. Operators and finishers are pieceworkers, while pressers and many miscellaneous workers are paid by the week. The economic distinction is important as the garment trades present great seasonal fluctuations in activity, work being brisk in the spring and fall and slack in the winter and summer months. This tempts pieceworkers to overdrive themselves during the busy season, from which there is a corresponding reaction in the dull season.

The postural differences consist in that, while operators and finishers work sitting, pressers and cutters work standing. Among females the proportion of those who sit is much greater than among males, because pressers, who form a large proportion of male workers, are few among females, and cutters are always males.

Social and physical data of garment workers.—The following table presents, in condensed form, the social and physical data derived from the examination of these workers:

TABLE 48.—*Summary of social and physical data of garment workers.*

		Male.	Female.
Number of workers examined:			
Operators		976	625
Pressers		720	....
Finishers		280	186
Tailors		54	....
Cutters		48	....
Miscellaneous workers		23	189
Total		2,091	1,000
Nativity:			
Russia	per cent	80.4	74.1
Austria	do	15.2	10.1
Italy	do	3.09	7.0
United States	do	.2	4.2
Other countries	do	1.11	4.6
Race:			
Jewish	do	96.6	88.8
Italian	do	3.08	7.7
German	do	....	1.8
Polish	do	.19	.5
Other races	do	....	1.1
Length of time in the United States	years	9.25	6.41
Length of time in special occupation	do	9.2	4.63
No previous occupations	per cent	23.3	71.2
Previous occupations	do	77.7	28.8
Percentage married	do	73.9	7.1
Average number of children born to married garment workers		3.21	1.82
Average number of children alive at time of examination		2.7	1.36
Percentage mortality of children born		15.82	24.8
Average annual earnings:			
Operators		$666.00	$445.00
Pressers		$562.00	....
Finishers		$486.00	$294.00
Tailors		$748.00	....
Cutters		$720.00	....
Miscellaneous workers		$893.00	$445.00
General average, all workers		$611.00	$376.00
Average number of persons in families of garment workers		5.35	5.78
Average number of rooms in homes of garment workers		3.98	4.26
Average number of rooms used as bed rooms, garment workers		1.58	2.04
Average number of occupants per room		1.37	1.35
Habitual users of tea and coffee	per cent	50.1	....
Occasional users of tea and coffee	do	35.9	....
Nonusers of tea or coffee	do	14.0	....
Habitual users of alcohol	do	19.3	....
Occasional users of alcohol	do	52.1	....
Total abstainers	do	28.6	....
Habitual smokers	do	44.8	....
Occasional smokers	do	2.7	....
Nonsmokers	do	52.5	....
Average age	years	32.29	22.86
Average height (in shoes for males; stocking feet, females)	inches	65.46	60.3
Average weight (in shoes and trousers males; sheet only, females)	pounds	141.21	119.9
Circumference of chest:			
At rest	inches	35.27	31.99
At inspiration	do	36.57	33.24
At expiration	do	34.82	31.88
Average expansion of chest	do	1.75	1.36

TABLE 48.—*Summary of social and physical data of garment workers*—Continued.

	Male.	Female.
Average vital capacity .... cubic inches..	225.3	....
Average abdominal circumference .... inches..	32.42	30.82
Average strength of grip:		
Right hand .... kilos..	33.6	16
Left hand .... do....	31	13
Evidence of protection against smallpox, good vaccination scars .... per cent..	92.1	90.7
Previous attacks of smallpox .... do....	2.9	1.6
Not protected by vaccination or previous attack .... do....	5.0	7.7
Average pulse rate	76.8	78.8
Average percentage of hemoglobin (Tallquist scale) .... per cent..	86.89	77.8
Average systolic blood pressure .... millimeters..	125.66	113.39
Average diastolic blood pressure .... do....	84.53	79.92
Average pulse pressure .... do....	41.13	33.4
Physical development:		
Good .... per cent..	29.5	66.2
Fair .... do....	44.6	27.5
Poor .... do....	25.9	6.3
Nutrition:		
Good .... do....	51.0	62.1
Fair .... do....	33.5	28.9
Poor .... do....	15.5	9.0

It was found, as a class, that pressers among males had the most robust physiques and stolid temperaments. Operators are more alert and intelligent but are likely to be high strung, imaginative, and nervous.

Finishers, as a class, have the worst physiques and lowest earning capacity, this class being the only one among garment workers in which males compete, more or less directly, with females. The physical superiority of pressers was marked. This is because their occupation requires considerable muscular exertion in a standing posture, thus confirming previous observations as to the better physical development of standing as compared to sedentary workers. The inferiority, from a physical standpoint, of finishers is accounted for by the fact that their work is the lowest paid in the garment trades and requires the fewest physical attributes. The physically inferior, therefore, naturally gravitate to this kind of work.

Females presented no striking differences of physique in their several groups.

One interesting point brought out by the investigation was the fact that while in the case of females occupation in the garment trades was apparently provisional, with the prospect of marriage and home making in the background, among males the industry was entered as a permanent means of livelihood. This is shown by the low average age of the women (22 years, as compared to 32 years for males), their shorter average time in the industry (4.6 years, as compared to 9.25 years for males), the low percentage of married females (7 per cent, as compared to 75 per cent for males), and other evidence tending to show that the large majority of females were members of families in which they were not the chief breadwinners.

The sense of personal responsibility arising from the knowledge of others dependent upon them was, therefore, very much greater in the case of males. This relative lack of responsibility tended to cause a much greater degree of vivacity and cheerfulness among women.

Defects and diseases of garment workers.—The incidence of defects and diseases was noted in the case of 3,086 workers (2,086 males and 1,000 females). As a result there were recorded 13,457 defects and diseases of all kinds, of which 9,541 were in males and 3,916 in females. This gives an average of 4.36 defects and diseases to each individual. It should be stated, however, by reason of the practice of noting all defects and diseases present, that in many instances the defects were of a minor character, interfering neither with health nor efficiency. On the other hand, many of them exercised a deleterious influence on the subject. Only about 2 per cent of those examined were found free from defects or disease.

The examination showed no vocational diseases peculiar to garment workers. Nevertheless, it was evident that the effect of sedentary occupations, such as the women's garment industries, was to intensify the bad effects upon health and efficiency of certain defects or diseases or to produce them in predisposed individuals.

Tuberculosis was undoubtedly the most important disease among garment workers. Three and eleven hundredths per cent of the males examined and nine-tenths of 1 per cent of the females were found to be tuberculous. This is a rate of prevalence for females of nearly three times and among males nearly ten times that of this disease among soldiers in the United States Army, for instance. It is thought, however, that the rate of prevalence may have been artificially raised from the circumstance that garment workers who suspected their condition upon hearing of the examination presented themselves for the purpose of ascertaining whether they were suffering from tuberculosis. On the other hand, in many instances the subject was unaware of his condition, having been conscious only of gradual impairment of health.

Be this as it may, tuberculosis is unduly prevalent among garment workers, especially among males. Factors influencing the greater prevalence in males are apparently their greater average age, longer average time in the industry, the high percentage of males with families dependent upon them, thus leading to self-denial on the part of the breadwinner in the matter of adequate food and clothing, responsibility and worry as to future prospects, and, finally, the added element of overspeeding in the busy season (operative especially for pieceworkers) in the endeavor to earn high wages for themselves and their families in order to tide over the slack season.

Tuberculosis was most prevalent among the poorest paid of the workers (pressers and finishers). It is also significant that these two groups occupied domiciles with the fewest average number of rooms among garment workers. As their families contained on the average the greatest number of individuals, the average number of persons to the room was also higher. The percentage of those having faulty postures was also greatest among finishers and, next to these, pressers.

Faulty posture, neglect of personal hygiene, and the presence of suspended matter (''fly'') in the air of shops must also be regarded as predisposing factors to tuberculosis in the garment trades.

Apart from tuberculosis, the most common defects and diseases among garment workers were, in order of frequence for both sexes combined, defective vision (69 per cent), faulty posture (50 per cent of males), chronic nose and throat affections (26.2 per cent), defective teeth (26 per cent), and pyorrhea aleveolaris (20 per cent), weak and flat feet (26 per cent), chronic constipation (23.7 per cent), dysmenorrhea (females, 20.2 per cent), hypertrophied tonsils (15.3 per cent), defective hearing (10 per cent), nervous affections (7.75 per cent).

In connection with the high percentage suffering from defective vision only 11½ per cent of those whose eyesight was subnormal wore glasses. Only 2.35 per cent of those with defective vision had glasses fully correcting the defect; in 7.5 per cent the defect was partly corrected and was not improved or made worse by the glasses in 1.67 per cent. Part of the poor results from the use of glasses among garment workers arose from the fact that the glasses had been prescribed by opticians or by poorly qualified medical practitioners. In other instances the type of visual error was such that partial correction was the best that could be secured.

With the exception of pressers, garment workers should be classed as eye workers, as the occupation makes great demands upon the visual organs. Finishers, on the whole, had the worst vision.

Even minor visual defects are of importance in the garment trades. When the defect is gross, the worker makes no effort to compensate for it through accommodation. With minor defects accommodative efforts are made to compensate for the error, so that eyestrain may develop. An important part of the hygiene of the eye, for eye workers, is the correction, by proper glasses, of even small degrees of visual errors.

A faulty posture was extremely common among garment workers, especially males. Among females the use of the corset and the greater consciousness of the personal appearance had an effect in diminishing the percentage of faulty postures. The bad effects upon health of faulty postures are well known, as they predispose to pulmonary affections, including tuberculosis, hernia, displacement of the abdominal organs, digestive troubles, weak and flat feet, habitual constipation.

The effect of occupation in the garment trades was to intensify bad postural habits. That the industry per se need not be responsible for faulty posture was shown by the good effects upon the individual of previous military training in European armies or of physical exercise. In many such instances the posture remained excellent, and the influence of the previous training was prolonged.

Chronic nose and throat affections were next in order of frequency. That the garment trades were not directly responsible for these conditions was shown by the fact that they were often observed without reference to the time the subject had engaged in the occupation. Moreover, from the condition of the mouth, nose, and throat, it was frequently evident that the condition had existed from childhood.

Most of the workers so afflicted stated that they were better in the summer than in the winter. An examination, however, of the data as to temperatures and relative humidities of workshops during February, March, and April, based upon Rogers's observations, showed that, as a rule, the average temperatures and relative humidities of workshops in the garment trades were by no means such as to foster, to any great extent, the prevalence of chronic catarrhal conditions of the nose and throat.

On the other hand, the presence of a considerable amount of suspended matter in the air of workshops, in the shape of ''fly'' from woolen materials, may well be a factor in aggravating existing nasal affections.

The circumstance should be taken into account, in explanation of the frequency of catarrhal affections of garment workers, that these workers for the most part have always been city dwellers, and hence exposed, from birth, to the influence of crowded and congested quarters, which are said to be factors in the production of chronic nose and throat affections.

Defective teeth and pyorrhea were very frequent among garment workers. The average number of effective teeth in the mouths of male workers was 24.63 and in females was 27.21. The deficiency from normal efficiency was therefore 7.37 teeth for males and 4.79 teeth for females. In addition, 26 per cent of males and 16.7 per cent of females suffered from pyorrhea. This disease is an important enemy of individual efficiency. Not only is health impaired by the attendant pain and discomfort, the malassimilation due to imperfect mastication, and the resulting digestive troubles, but pyorrhea, as shown by recent studies, must be considered an important source of systemic infection with pathogenic bacteria.

Garment workers also suffered severely from habitual constipation, which affected 23.7 per cent of all examined. This does not include a larger number complaining of irregularities of a less chronic character. The prevalence of this affection seemed to be due to faulty postural habits, dietetic errors—a sedentary occupation—but principally to neglect on the part of the workers to form habits of daily defecation.

Hearing was found to be impaired in a considerable proportion (10 per cent) of the workers examined. No doubt much of this was due to the extension of chronic inflammations of the nasopharynx to the middle ear. Industrial noise, however, probably played some part in producing impairment, as the loud vibratory noises of electrically driven sewing machines may well have a deleterious effect upon the hearing after exposure for long periods.

Nervous affections were common among garment workers. The most frequent of these was neurasthenia, which affected, principally, pieceworkers among the males. A much larger number, who had no definite neurosis, seemed predisposed to neuropathic affections.

It would seem that, of all conditions in the garment trades, the one most favoring predisposition to neuroses is the marked seasonal fluctuation in activity of the trade. During the busy season there is the constant overdriving of himself by the worker in the endeavor to earn sufficient to tide himself and his family over the dull season, which, in its turn, affords abundant leisure for introspection, gloomy imaginings, worry over the future, and similar painful thoughts, which are well known to favor the development of psychoneuroses.

The prevalence of venereal diseases among garment workers was investigated in the case of males only. Two hundred and fifty-nine blood specimens were tested for the presence of syphilitic antibodies. Of these three gave a positive reaction, indicating a prevalence of syphilis of a little over 1 per cent. Of 550 male workers in whom the previous venereal history was ascertained, 122, or 22 per cent, stated that they had previously suffered from gonorrhea.

That the general condition of health of garment workers was by no means satisfactory is shown by the large number of those examined who had subjective complaints to make about the state of their health. About 70 per cent of all examined had such complaints, while the remaining 30 per cent stated that they felt well. Thus, over two-thirds of those examined did not feel perfectly well. Pain of some kind was the most frequent complaint; digestive disturbances, such as dyspepsia and constipation, came next. Some 10 per cent of males and 25 per cent of women complained of frequent headaches. Nine per cent of males and 4 per cent of females complained of weakness, general, or of the extremities.

CONCLUSIONS.

1. Among male garment workers, pressers have the most robust physiques. The physical inferiority of finishers to pressers was marked. Operators stood in physique midway between pressers and finishers. The superiority of the physique of pressers is due to the more active character of their occupation and the standing

posture at their work. Among females no striking physical differences were observed in the various classes of workers.

2. The degree of physical development among garment workers is fair only. Among males, especially, a good state of the nutrition if far more common than a good state of the development. Owing to inactivity, a tendency to overweight develops with increasing years. The average expansion of the chest of both males and females is not high.

3. The chief difference between male and female workers in these industries seems to lie in the fact that male workers take up the trade as a permanent means of livelihood, whereas in females, occupation in the industry seems to be more or less provisional.

4. Garment workers, as a class, exhibit a large number of defects and diseases, only about 2 per cent being free from defects. That these defects or diseases are of such character as to interfere with individual efficiency is shown by the large number of workers (over two-thirds) who do not feel perfectly well.

5. Tuberculosis is undoubtedly the most serious disease prevalent among garment workers, being over three times as prevalent among males as among females. That the disease is unduly prevalent among these workers is shown by the fact that among the females examined it is about three times and among males nearly ten times as common as among soldiers in the Federal Army.

6. The disease is most prevalent, both in males and females, in the poorest paid class of garment workers, i. e., finishers. This is in conformity with a well-known economic law in regard to the prevalence of tuberculosis, the tuberculosis rate being roughly in inverse ratio to the income.

Besides lower earning capacity, other disadvantageous economic conditions tend to cause greater prevalence of tuberculosis among workers in the finisher groups. These are more subject to overcrowding in the home than other workers, because of a lower average of rooms in their domiciles and a larger average number of members in the family.

7. A postural influence may be discerned as affecting the prevalence of tuberculosis, finishers (among males) showing the greatest percentage of faulty postures.

8. The garment industries themselves favor the prevalence of tuberculosis in the following ways:

(*a*) By intensifying bad postural habits.

(*b*) Possibly by reason of the presence of suspended matter (woolen "fly") in the air of workshops.

(*c*) By reason of the low rate of metabolism induced by the inactivity of a sedentary occupation.

9. The proneness of garment workers to affections of the respiratory tract is shown by the percentage of workers who suffer from emphysema of the lungs, chronic bronchitis, and chronic catarrhal conditions of the nasopharynx.

10. Nevertheless, apart from the possible effects of suspended matter in the air of workshops in favoring respiratory disease (a variable factor according to the shop and the materials used), there were no vocational diseases peculiar to the garment trades. Occupation in these trades, however, seemed to intensify the bad effects upon health of certain defects and diseases, such as faulty postures, digestive affections, and the like.

11. Apart from tuberculosis, the chief defects and diseases from which garment workers suffer are: Defective vision, faulty posture, flat feet, chronic catarrhal affections of the rhinopharynx, defective teeth and pyorrhea, digestive troubles, and nervous affections.

12. A large part of the complaints of garment workers is due to the existence of one or more of the conditions just enumerated.

13. The great prevalence of subnormal vision among garment workers is a matter of importance as the garment industries make exacting demands upon the eyes.

14. The number of workers who wear glasses is relatively low compared to the number needing them.

15. In trades such as the garment industry the correction of small visual errors is of importance in order to prevent the development of symptoms of eye strain.

16. Faulty postures are extremely common among garment workers. They tend to increase the prevalence of respiratory and intestinal diseases, visceroptosis, hernia, flat and weak feet, and similar defects and diseases. The effect of occupation in the garment trades is to intensify bad postural habits.

17. Bad postures are not necessarily induced by occupation in the garment industries provided the individual enters the trade with a correct carriage. The good effects of previous military or of physical training were marked and prolonged in the maintenance of good postural habits.

18. Chronic catarrhal affections of the nose and throat are very prevalent among garment workers. These are the cause of considerable discomfort to the workers, causing them to seek relief at dispensaries. A number of those examined had undergone operations for the relief of such conditions.

19. The garment trades, in themselves, did not seem directly responsible for the existence of these conditions as, in many instances, they had apparently existed from childhood. The great prevalence of these diseases may be partly accounted for from the fact that the

great majority of garment workers have been city dwellers from birth and, presumably, always exposed to the crowded and congested conditions said to favor the genesis of chronic nasopharyngeal affections.

20. An examination of data as to temperatures and relative humidities in workshops of the garment trades during February, March, and April showed no reason to suppose that the prevalence of catarrhal affections was favored by incorrect temperatures or relative humidities in such workshops.

21. The presence of suspended matter ("fly") in the air of workshops would, when present, tend to aggravate chronic nasopharyngeal affections.

22. Defective teeth and pyorrhea were common among garment workers. They were the cause of pain, discomfort, and ill-health due to imperfect mastication and subsequent malassimilation. The presence of oral sepsis, due to defective teeth and pyorrhea, must also be regarded as an important source of systemic infection.

23. Habitual constipation affected many workers, male and female. Dietetic errors, a sedentary occupation, faulty postures, all were etiological factors. The chief cause, however, of this condition was the neglect to form regular habits of defecation.

24. Defective hearing was common. The majority of these cases are doubtless due to extension to the middle ear of chronic catarrhal affections of the nose and throat. Continued exposure, however, to the vibratory noise made by sewing machines in workshops, doubtless has an effect in damaging the hearing.

25. Nervous affections, particularly neurasthenia, are common among garment workers, expecially males. Pieceworkers are mainly affected. The element in the garment trades thought to be particularly active as an etiological factor, consists in the characteristc fluctuation in seasonal activity of the industry. This fluctuation seems to be operative in the following way: During the busy season pieceworkers overdrive themselves in order to earn a high wage to provide for themselves and their families during the dull season. When this sets in a reaction takes place, feverish energy being replaced by introspection, forebodings over the future, and similar painful mental states known to favor the genesis of neuroses.

26. The prevalence of syphilis, as shown by the previous histories, and the results of the Wasserman test, was decidedly low.

27. On the whole, a large part of the defects and diseases of garment workers arise from ignorance or neglect of personal hygiene. A proper regard of these principles on the part of the workers would go far in nullifying the bad effects of a sedentary indoor occupation upon the health.

RECOMMENDATIONS.

In view of the foregoing it is evident that physical defects and ill health, resulting from the neglect or ignorance of personal hygiene, seem to be important factors in the reduction of efficiency of garment workers.

The effects of occupation in these trades upon the individual present great variations, depending upon whether the worker enters the trade with a well-developed body and good hygienic and postural habits or the reverse. That the possession of such habits is of inestimable benefit to the individual was emphasized by the investigation.

In spite of the fact that the attempt to increase the knowledge of busy workers as to the principles of personal hygiene is not likely to be followed by results commensurate with the effort expended, it is nevertheless strongly urged that the Joint Board of Sanitary Control amplify and extend the efforts it has made in the past to increase the knowledge of workers as to personal hygiene. It is particularly recommended that in the future stress be laid upon the following points:

(*a*) The necessity for the correction of visual defects.

(*b*) The necessity for the formation of correct postural habits.

(*c*) The necessity for attention to oral hygiene, particularly in regard to the consistent daily use of the tooth brush and proper dentifrices and the use of prophylactic fillings for cavities as they appear.

The tendency of garment workers to neglect their mouths until crown and bridge work or artificial dentures are necessary is not only a cause of much needless expense, but the results are far inferior to fillings when these are put in in time.

(*d*) An effort should be made to reduce the amount of habitual constipation among garment workers by disseminating information as to the cause and means of prevention of this affection.

(*e*) Attention should be directed toward the elimination of "fly" from the air of workshops. Dry sweeping should be rigidly suppressed. Floors should be constructed, so far as practicable, with tight joints, smooth surfaces, and coated with some dust-retaining oil. Suction cleaning is desirable where practicable. The vibration of machines, transmitted to floors, should be reduced by means of blocks of rubber or similar damping substances beneath machine supports.

The attachment of small suction nozzles or similar dust-exhausting devices at the knives of cutting machines is worth considering, as these machines undoubtedly produce considerable "fly," especially when heavy woolen materials are cut.

(*f*) The spread of communicable diseases in workshops should be guarded against by more rigid enforcement of the regulations against promiscuous spitting, the use of the common drinking cup, the common towel; numerous evasions of these regulations having been noticed in shops of the trade. The high rate of prevalence of tuberculosis among garment workers makes the consistent enforcement of such regulations imperative.

(*g*) While from observations it would appear that the conditions of temperature and relative humidity are fairly satisfactory in clothing shops, the dry bulb temperatures, as pointed out by Rogers, are apt to be too low in winter. An effort should be made in workshops of the garment trades, during the season when artificial heat must be employed, to have the temperature maintained between 62° F. and 70° F. The relative humidity should never exceed 65 per cent, nor be lower than 35 per cent. From 48 to 52 per cent is the optimum.

(*h*) Owing to the great number of faulty postures among workers, the fatigue arising from sitting on seats improperly supporting the body and similar conditions, an effort should be made to promote the use in the garment trades of adjustable seats with backs.

(*i*) In view of the efficient organization of garment workers, and the relative ease with which information can be disseminated among them, the suggestion is made that the trades establish a special dispensary for garment workers, convenient to the clothing district, where special attention will be paid to the correction of ocular defects, dental prophylaxis, and diseases of the respiratory and digestive tracts.

(*j*) In regard to the treatment of tuberculosis, the extension of the establishment of sick benefit funds as inaugurated at present in some of the locals of the cloak, suit, and skirt makers union is recommended. For tuberculous workers who are able to work, open-air shops might be established.

(*k*) The Joint Board of Sanitary Control is also urged to extend its system of physical examinations, so that all workers who apply may receive an opinion as to their physical condition and proper advice be furnished them. The advantages to be derived from such periodical examinations in maintaining a permanent condition of good health should be made generally known among the workers.

(*l*) The Joint Board of Sanitary Control should do all in its power to impress upon educational authorities the vital necessity for the physical supervision of school children and their efficient instruction in the principles of personal hygiene.

It seems evident that the remedies just suggested for the present unsatisfactory condition of the health of garment workers can never be substitutes for the prophylaxis resulting from an ingrained knowledge of the practical application of the principles of personal hygiene derived from a public-school education, in which such instruction is a fundamental part. In other words, the proper time for forming correct postural, oral, and intestinal habits is not after a worker has entered a given occupation, but is an important part of the training of the period of growth and development. This investigation has only emphasized the fact that instruction in such matters is quite as important for the individual as learning to read and write.

Present courses in instruction in hygiene in public schools should therefore be amplified so as to constitute an integral and important, instead of subsidiary and incidental part in the school curriculum.

There is also necessity for systems of physical supervision of school children which really supervise and cause to be removed physical impediments to healthful development.

Postural training is also of vital importance. Children should receive postural training in the schools of such fundamental thoroughness that the effects of this training, upon leaving school, would be manifest throughout their lives. Greater facilities for correcting defective dental conditions are also urgently needed. The Joint Board of Sanitary Control should urge, so far as in it lies, an increase in the facilities of school dental clinics.

PART II.

THE HYGIENIC CONDITIONS OF ILLUMINATION IN WORKSHOPS OF THE WOMEN'S GARMENT INDUSTRY.

By J. W. Schereschewsky, Surgeon, United States Public Health Service, and D. H. Tuck, Assistant Physicist, United States Public Health Service.

In view of the fact that a large part of the industrial operations in the women's garment trades involve the close and continuous use of the eyes, the illuminating conditions which prevail in the workshops of the industry become highly important from the standpoint of industrial hygiene. The necessity for adequate and correct illumination on the various working planes becomes the more apparent from the consideration of the data in relation to the vision of garment workers contained in the foregoing portion of this report. These data show that only a little over 25 per cent of the workers whose visual acuity was tested had normal vision in both eyes.

While the hygienic conditions of illumination are always of importance in all workshops, offices, schools, and public buildings, they become doubly so when the work to be illuminated requires a closer and more constant use of the eyes than reading, for example, and when the group of workers involved are prone to visual defects.

Therefore, when the Surgeon General of the Public Health Service was requested by the Joint Board of Sanitary Control to include in the investigations made by the service, the hygenic conditions of illumination in the workshops of the trades, the importance of this phase of prevalent working conditions was fully recognized.

General scope of the investigation.—The scope of this part of the investigation embraced the following points:

1. The making and collection of a number of physical and photometric measurements in a representative group of workshops of the cloak, suit and skirt, and dress and waist industries, sufficient to compute the average of prevailing conditions of illumination upon working planes.

2. An inquiry as to whether the basic principles of illumination were adhered to in the workshops of the industry.

3. If departures from such principles were found to be prevalent, the formulation of recommendations necessary to place the illumination of workrooms in these industries upon a good hygienic and economic basis.

Acknowledgments.—Acknowledgments are due and are hereby made to Dr. George M. Price, director of the Joint Board of Sanitary Control of the Cloak, Suit and Skirt, and Dress and Waist Trades of New York City, whose cooperation facilitated entry into workshops for the collection of these data and to the Director of the Bureau of Standards, Washington, D. C., for calibration of apparatus used and for determination of the distribution curves of combinations of lamps and reflectors commonly used in the workshops of the women's garment industries.

GENERAL PRINCIPLES OF NATURAL AND ARTIFICIAL ILLUMINATION.

Before proceeding to the presentation and discussion of the data collected brief reference should be made to the considerations involved in natural and artificial illumination of workshops.

NATURAL ILLUMINATION.

As openings in the walls of buildings are the only means at our disposal for lighting an interior by daylight, the degree of daylight illumination of a room depends primarily upon the area of the openings, or window area. Because of this, it may be thought that, in order to secure adequate illumination of an interior it is merely necessary to specify a minimum ratio of window area to floor area for any class of building. For factories, the ratios of 1 to 4 or 5 and for office buildings, 1 to 7 or 1 to 10, have been advocated for this ratio.

While these ratios are useful in the general design of buildings, they do not give necessarily a true measure of the illumination which will be available, because of the variability of other factors presently to be discussed.

Sources of daylight.—We may distinguish primary, secondary, and tertiary sources of daylight illumination.

Secondary sources.—While the primary source of daylight illumination is, of course, the sun, we depend, for daylight illumination, upon the light reflected from the sky, rather than that of the sun. The sky, therefore, is the great secondary source of natural illumination.

Intrinsic brilliance of the sky.—An important factor in the adequacy of natural illumination is the intrinsic brilliance of the sky. This varies greatly under different meteorological conditions.

According to a series of measurements of intrinsic sky brilliance made in 1897 by the American Lucifer Prism Co.,[1] we may divide weather conditions affecting the intrinsic brilliancy of the sky into five classes, as follows:

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[1] Lectures on Illuminating Engineering, Johns Hopkins University, Hopkins Press, 1911, Vol. II, pp. 651–652.

1. Nimbus clouds, no blue sky, no sun, storm present or near.
2. Cloudless sky, either clear blue or hazy.
3. Blue predominating, clouds generally cirrus.
4. Clouds, predominating, generally cumulus.
5. Overcast, no blue.

The following chart shows the variation of intrinsic sky brilliance, in candle power per square foot of sky for these five meteoroloigcal conditions:[1]

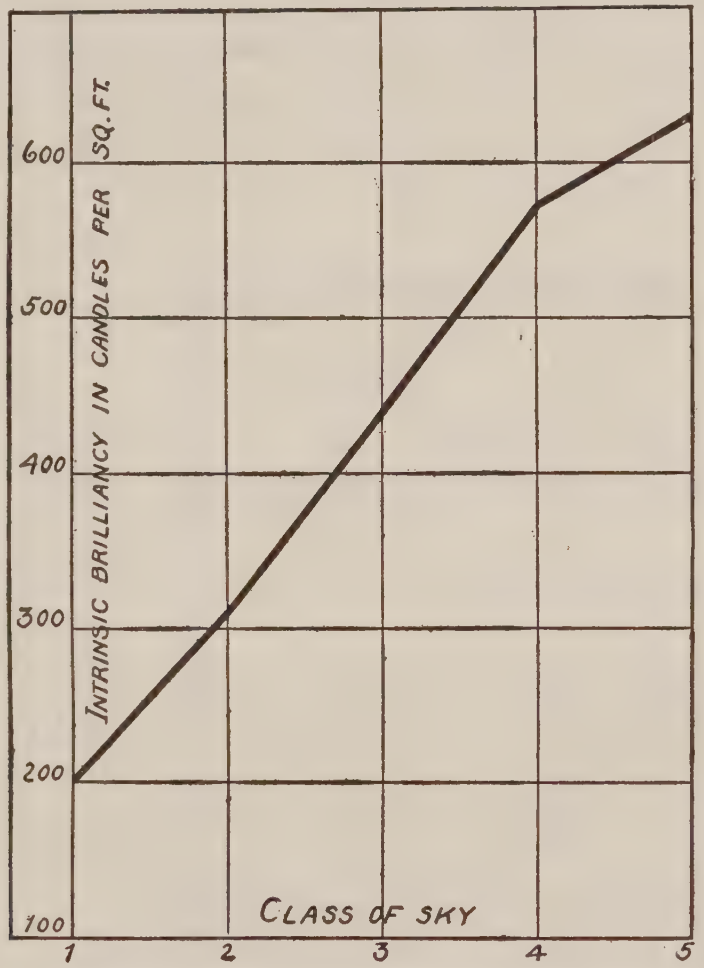

FIG. 1.—Variations in sky brilliance according to cloud conditions (Lectures on Illuminating Engineering, Johns Hopkins University, Hopkins Press, 1911, Vol. II, pp. 651–652).

It is seen from this chart that the intrinsic brilliance of the sky is greatest when no blue is visible.

The important part played by sky brilliance in the illumination of interiors has resulted in the recommendation by investigators of illumination that, for certain classes of buildings, such as schools, the solid angle subtended by the visible sky shall not be less than a prescribed number of square degrees in order to secure adequate illumination. The data in relation to the solid angle subtended by the visible sky at any working plane, however, must be accompanied by data giving the angle of elevation of the sky above the reference plane in order to give a true index of the resulting illumination.

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[1] Lectures on Illuminating Engineering, Johns Hopkins University, Hopkins Press, 1911, Vol. II, pp. 651–652.

Sky angle.—The number of stations within a room from which open sky may be visible, is primarily dependent upon the sky angle of the room. The sky angle of a room is understood in this report to be the angle formed between the vertical wall of the building and a line drawn from the top of the nearest building to the top of the window. The sky angle is, therefore, dependent upon the vertical dimensions of windows, the distance of windows from opposite buildings, the height of neighboring buildings, and the story in which rooms are situated. (For the method used for determining the sky angle of workrooms see Appendix A.)

The following figure (fig. 2) is typical of the relation of loft buildings occupied by the cloak, suit, and skirt, and dress and waist industries of New York City to the sky and adjacent structures:

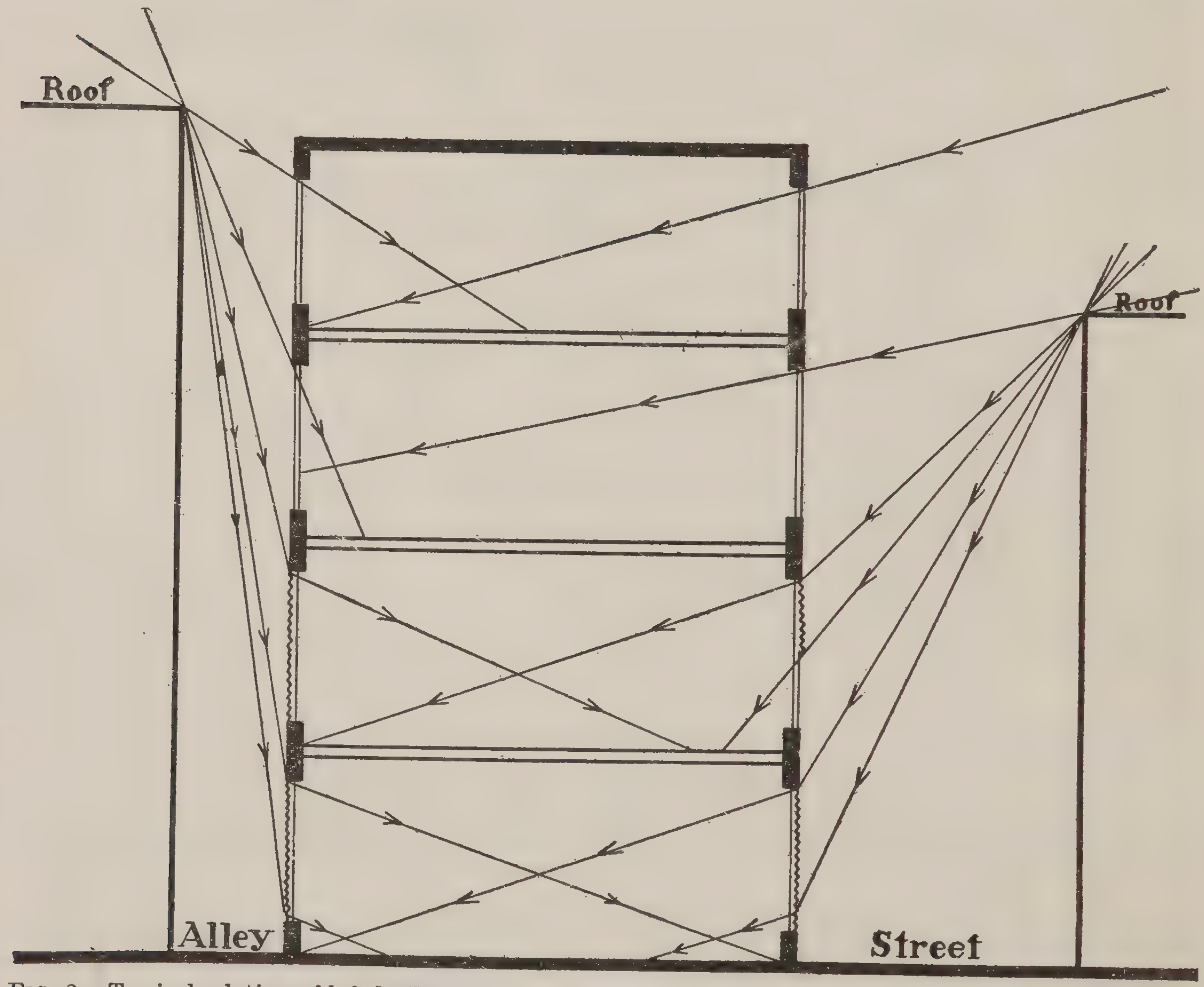

FIG. 2.—Typical relation of loft buildings in the Women's Garment Industries, New York City, to the sky and adjacent structures.

It is evident, from the figure, that on the upper floors there may be free access afforded to the light from the sky, whereas such direct light may be partially or completely cut off from the lower floors. It is frequently the case that the angle of incidence of the light from the sky is nearly or actually the critical angle, so that the incident light is practically all reflected from the surface of the window glass instead of being transmitted by it.

It is under such conditions that the use of prism or of factory ribbed glass, with the corrugations on the exterior surface is of great benefit by reason of the change these produce in the angle of incidence, thus permitting a large portion of the light to be refracted into the interior. The assistance derived from the use of such window glass is well shown in the case of the lower floors of the building shown in figure 2.

Effects of window glass.—The type of window glass used and its condition of cleanliness affect the amount of light transmitted. Plain, clear glass is generally assumed to transmit about 90 per cent of the incident light for angles of incidence of less than 30°. When this angle is larger the percentage of transmitted light rapidly falls off because of increased reflection.

The following chart (fig. 3) shows the characteristic transmission curve for light incident upon plain glass for angles of incidence between 0° and 90°.[1]

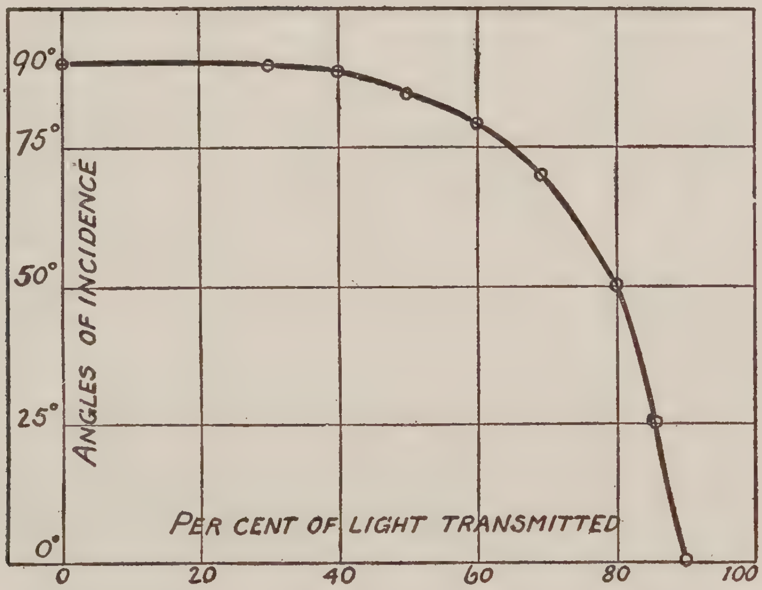

FIG. 3.—Transmission curve of glass for light according to angle of incidence (Lectures on Illuminating Engineering; Johns Hopkins University, Hopkins Press, 1911, Vol. II, p. 651–652).

In the case of factory wire glass, the transmission, for equal angles of incidence will be less than for plain glass, both because of the imbedded wire, and the inferior translucency of the glass.

In the case of rough or frosted glass, the transmission is also less for equal small angles of incidence, but for large angles, the transmission is greater provided the light fall on the roughened surface. Ribbed and prismatic glasses should only be used when the angle of incidence is large or when the light is to be redirected, as the smaller transmission coefficient of such glasses renders their use disadvantageous where the angle of incidence is small.

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[1] Lectures on Illuminating Engineering Johns Hopkins University, Hopkins Press, 1911, Vol. II, pp. 651–652.

Effects of cleanliness.—Besides the conditions affecting the daylight illumination just enumerated it is evident that the condition of cleanliness of the window surfaces exercises a marked influence upon the amount of light transmitted. Dirtiness of windows may reduce by as much as 50 per cent the amount of light which is capable of being transmitted by the opening.

Tertiary sources of illumination.—Besides the light from the sun and sky there are certain tertiary sources of daylight illumination. These are the light reflected from the surfaces of neighboring buildings and street surfaces. While necessarily of lower intrinsic brilliancy than the source by which they are illuminated, such tertiary sources, are, nevertheless, important factors in the daylight illumination of interiors, especially on the lower floors of loft buildings, some of which receive no direct light from the sky. Interiors of this type are entirely dependent on tertiary sources for their light.

The degree of illumination obtained in such interiors varies, of course, with the intrinsic brilliancy of the tertiary sources. The brilliance of tertiary sources is, approximately, that of the sky less the amount of light absorbed by the tertiary surface. Thus, other things being equal, the amount of illumination available is dependent upon the coefficient of reflection of the tertiary sources.

Distribution of illumination.—For correct illumination of interiors it is not sufficient merely to deliver an adequate light flux to the interior. This light must be distributed over working planes as uniformly as possible and in such manner that the illumination will not fall too rapidly as we proceed from the windows to the center of the room. While it is the province of the architect to provide for adequate access of light, it is the duty of the illuminating engineer, so to arrange manufacturing equipment in workshops, that the available illumination shall fall on working planes from a proper direction, that the distribution curve of illumination shall have a gradient suitable to the various industrial processes in question, and that machines, fittings, and stock shall be so disposed as not to cause extensive local shadows.

The color and finish of walls and trim is also of much importance, as they have an effect on the illumination in the same manner as the color and surfaces of adjacent or opposite buildings.

Summary of the principles of daylight illumination.—The basic principles of daylight illumination may be summarized as follows:

1. The amount of light admitted to the interior should be as large as possible.
2. The light should reach the center of the room.
3. The distribution of the light upon working planes should be as uniform as possible.
4. The light should fall upon working planes from a proper direction.

5. The walls and trim of the room should be of such color and surface as to absorb but little of the incident light.

6. Manufacturing and other equipment should be so disposed as to avoid casting extensive local shadows.

ARTIFICIAL ILLUMINATION.

Artificial illumination must be provided whenever the daylight illumination falls short of the requirements for good vision or when conditions are such that it must be depended upon as the sole source of light. Since natural illumination is the kind best suited to our visual needs, the problem of artificial illumination consists in approximating daylight conditions as closely as possible.

One of the chief difficulties in approximating natural by artificial illumination lies in the fact that while the source of daylight is the sky, a large surface of comparatively low intrinsic brilliance, artificial sources are practically point sources, and, consequently, when efficient, of very high intrinsic brilliance. It is the problem of producing similar lighting effects from sources so widely different which has engaged the attention of so many workers. Were it not for the wide range of adaptability of the eye to various luminous intensities its solution would, indeed, be most difficult.

We have, however, certain generally acknowledged working principles which are briefly as follows:

1. The illumination should be adequate for the work to be illuminated.
2. Uniformity of distribution is a great desideratum.
3. The color of the light should be adapted to the nature of work performed.
4. Glare effects should be eliminated.
5. Troublesome shadows are to be avoided.

Intensity of illumination.—The intensity of illumination required is a variable quantity governed by a number of factors. These factors, themselves, are variable, and some are incapable of exact estimation. The following are the more important:

(*a*) The location of the light sources with reference to working planes.

(*b*) The chromatic composition of the light.

(*c*) The degree of contrast between the illumination of the working plane and that of the other parts of the room.

(*d*) The color and reflection coefficient of the walls, ceilings, trim, and floors.

(*e*) The amount of reflection from the machinery, equipment, or material used in the industrial operation, and the state of the surfaces involved.

(*f*) The condition of the eyes of the worker.

So far as the cloak, suit and skirt, and dress and waist industries are concerned, many of these factors are identical in practically all the shops. Thus, because of similar arrangement of processes in loft buildings the degree of contrast between the illumination of a particular working plane and that of other portions of the room is of the same order of magnitude. The color and reflection coefficient of walls, ceiling, and trim are also similar. The amount of reflection from parts of machinery is practically the same for similar apparatus.

While it is difficult to specify a minimum illumination which shall be adequate for any particular class of work, it is practicable to specify that, to constitute favorable conditions, the illumination required for certain operations shall not fall below a certain minimum, due consideration being taken of the reflection coefficient (albedo) of the material worked upon. In view of the exacting conditions under which the eyes are used in the women's garment industry, conditions, which, on the whole require better illumination than mere reading, it has been assumed, that to secure adequate illumination, the intensity upon working planes should not fall below 5 foot-candles, when light materials are worked upon and 7 foot-candles when the materials are dark.

Reasons for minimum standard of 5 foot-candles.—It is perhaps pertinent, at this point, to say a few words about the reasons for fixing the minimum requirements of illumination in the garment industries at 5 foot-candles, in view of the fact that it is possible to see to read with intensities as low as one-half foot-candles. In a summary of the Interim Report on Daylight Illumination of Schools, issued in England by a joint committee,[1] the statement appears that, during most of the school hours, a place sufficiently lighted for school work will probably yield photometric readings of at least 5 to 10 foot-candles.

Now, the use of the eyes in schoolroom work involves the viewing of surfaces such as a printed page, in which contrasts in brightness are great. In the garment industries, on the other hand, the surfaces viewed afford no such contrasts. The reflection coefficient of the material is often low, the thread or other "findings" match the material in color. The testimony of those who do needlework is, from personal statements, to the effect that "they can see to read when they can not see to sew."

It would seem, therefore, that the minimum standard of 5 foot-candles recommended is conservative, in view of the nature of the work in the garment industry. While seeing is possible with lower intensities, a further disadvantage of such low intensities, as pointed out by Fitz,[2] lies in the fact that the pupillary aperture is dilated at low illuminations. Hence a greater area of the optical surfaces of the eye are uncovered. This has the effect of intensifying the optical defects of cornea and lens, thereby incurring the danger of eye strain, even in apparently normal eyes.

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[1] Illuminating Engineering, London, July, 1914, p. 363.

[2] Fitz, G. W.: Practical Methods for Testing Natural Illumination. Transactions, IV International Congress of School Hygiene, Buffalo, N. Y., 1913, Vol. II, p. 396.

By reason of the frequence of visual defects among garment workers, the disadvantage of low intensities of illumination is further emphasized.

Distribution.—It is not sufficient to have an adequate flux of light upon the working plane. The flux must be so distributed that the contrast between adjacent portions of the working planes will not be noticeable. Besides this, the contrast between the illumination of working planes and that of the surroundings should not be excessive.

Distribution causing alternate areas of light and darkness should be avoided so far as practicable. Adherence to the principle that artificial illumination should approximate daylight illumination requires that, while shadows are necessary and unavoidable, such shadows should be in true relation to the objects casting them and that, furthermore, there should be sufficient diffused light to permit seeing clearly into shadows.

Glare.—The prevention of glare effects in artificial illumination is important, as these are prone to occur owing to the point character and high intrinsic brilliance of artificial sources.

For easy vision, the object one desires to see should be the brightest in the visual field. This arises from the fact that the eye adapts itself to the intrinsic brilliance of the brightest object in the field of vision. When some object other than the object to be viewed is the brightest in the visual field, glare is said to be present.

The amount of glare is influenced by two factors: (*a*) The angle of glare, and (*b*) the difference in intrinsic brilliance between the intruding object and the one to be viewed.

Angle of glare.—The angle of glare is the angle formed by a line connecting the eye of the observer and the intruding object and a similar line drawn from the object to be viewed, when the eye is fixed upon the latter. It is evident that glare will not be present when the angle of glare is greater than the visual angle in that particular direction.

As the angle of glare diminishes, the intruding object approaches the center of the visual field.

With constant angles of glare the degree of obscuration of vision produced by an intruding object, such as a light source in the field of vision, is a function of the difference in intrinsic brilliance between the intruding object and the object to be viewed.

Shadows.—We have become so accustomed to shadows that we appreciate but little their importance. Yet their presence is essential to vision. Proper shadows enable us to perceive the solidity of objects and to judge of their relative shape and sizes. Shadow production by artificial illumination should approximate that of daylight—i. e., the light should be especially directed toward working planes, yet at the same time should emanate from a sufficient number of sources to produce shadows giving true appreciation of the contours of objects. A perfectly diffuse light, emanating from all directions, would be highly objectionable, because by lack of shadows vision would then become very difficult. There should be, nevertheless, sufficient diffusion to permit seeing clearly into shadows, and yet to cause shadows to have the proper density. Troublesome shadows are those which do not assist in defining the contours of objects, which tend to exaggerate their size or distort their shape and moving shadows.

Light sources which make a small angle with the horizontal to the object viewed produce elongated shadows, which cause the exaggeration and distortion above referred to. Swinging light sources cause moving shadows and alter the original light distribution.

Color of light.—It is obvious that the color of artificial light used in industries requiring color discrimination should approximate that of daylight.

The following table shows a comparison of the color components of ordinary light sources, as determined by Ives,[1] the composition of daylight being taken as: Red, 100; green, 100; blue, 100.

TABLE 1.—*Color composition of ordinary light sources as compared to average daylight (Ives).*

Source.	Red.	Green.	Blue.
Average daylight	100	100	100
Sunlight, 2 to 5 p. m.	100	91	56
Welsbach:			
One-fourth per cent cerium	100	81	28
Three-fourths per cent cerium	100	69	14.5
Tungsten (1¼ watts per mean horizontal candle)	100	55	12.1
Nernst	100	51.5	11.3
Acetylene plane	100	50	10.4
Gem (2.5 watts per mean horizontal candle)	100	48	8.3
Carbon (3.1 watts per mean horizontal candle)	100	45	7.4
Flat flame, gas	100	40	5.8

It is seen, from this table that, of the ordinary artificial sources, the Welsbach mantle with one-fourth per cent cerium resembles average daylight the closest in its chromatic composition followed by the three-fourths per cent cerium Welsbach mantle. Of the incandescent electric lamps the tungsten light gives the closest approximation.

One great defect in all our present available incandescent artificial sources is the relative preponderance of red over blue. This is disadvantageous because of the lack of coequal stimulation of the red, green and blue sensations of the retina, and because it seems probable that blue component of light is more efficient in stimulating complete adaption to existing luminous intensities than red.

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[1] Ives, Herbert E.: Color Composition of Light Sources. Transactions of The Illuminating Engineering Society, November, 1908.

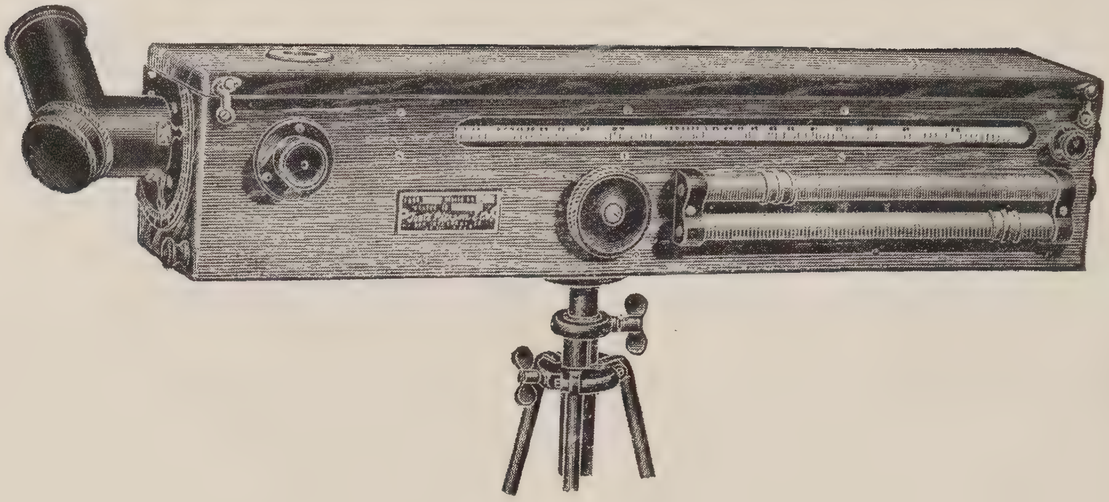


Fig. 4.—Sharp-Millar photometer.

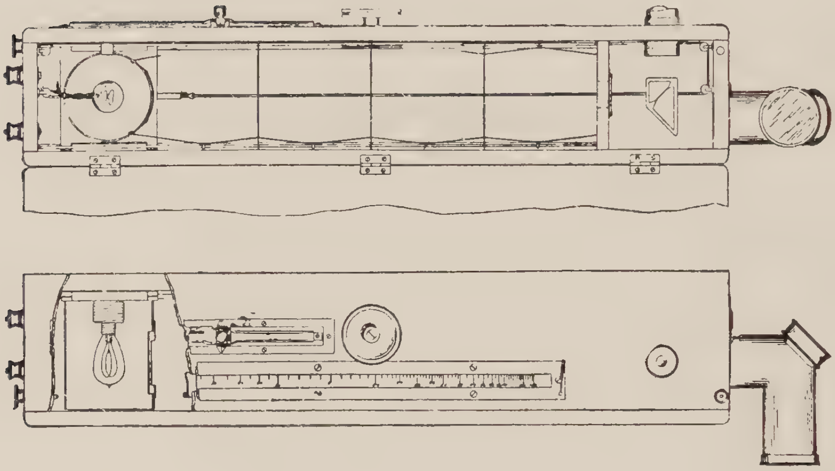


Fig. 5.—Side elevation and plan of Sharp-Millar photometer.

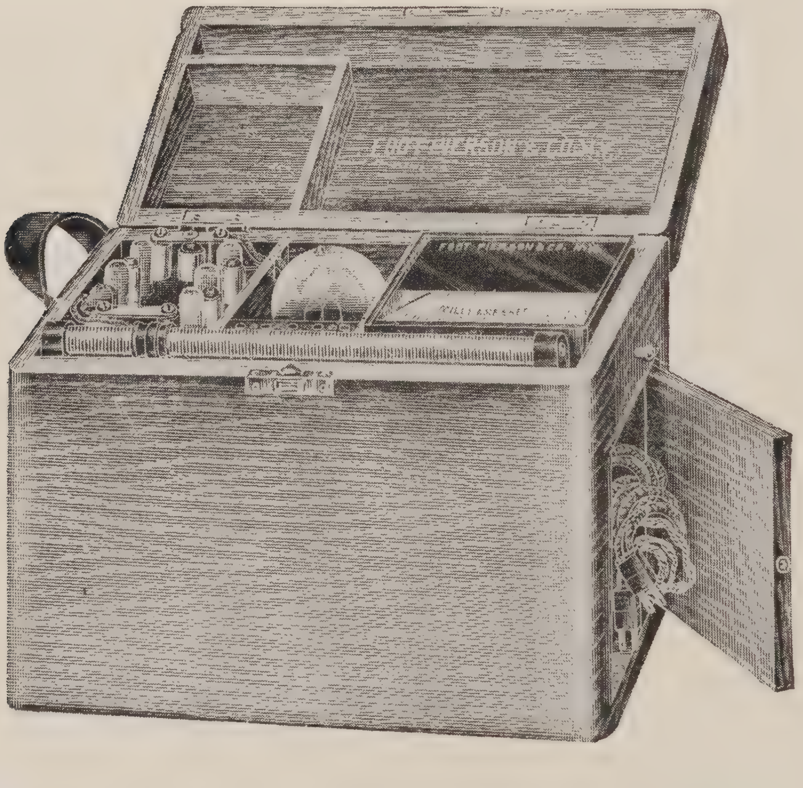


Fig. 6.—Storage battery, voltmeter, regulating resistance, and leads in box.

DETAILS OF INSPECTION.

Description of apparatus used in measurements.—All photometric measurements were made with a Sharp-Millar standard size photometer.

This instrument is designed particularly with a view to a wide range of usefulness, to convenience in handling, and to accuracy in results. A view of the instrument is shown in the following figure 4 (Plate VI) and a plan and elevation in figure 5.

This photometer is of the equality of brightness type. The moving part is the secondary standard lamp which illuminates a piece of ground glass on the right-hand side of the photometric device. The photometric device is a modification of a Lummer-Brodhun prism which brings rays from opposite directions into the sight tube by the addition of another totally reflecting surface. Photometric settings are made by matching the brightness of the milk glass cap on the elbow tube with that of the ground glass which is illuminated by the working standard lamp. There is a 45° cap at the angle of the elbow tube. In one side of this cap is a mirror used in reflecting the transmitted rays from the test cap to the photometric device. In the other side of the cap is a diffusely reflecting surface used for measuring intensity. By removing the test cap a detached test plate can be used.

The photometer can be used for measuring illumination, intensity, and intrinsic brilliance. Neutral glass absorption screens are used to increase the range of the instrument and glass color screens are used to match the color of the light to be measured with that of the secondary standard lamp.

Current to the secondary standard, is supplied from a 6-volt storage battery and the drop of potential across the lamp is maintained by reference to a voltmeter. The storage battery and voltmeter are contained in a box shown in figure 6.

The apparatus was calibrated by the Bureau of Standards.

Initial inspection.—An initial inspection, covering 94 shops in the cloak, suit and skirt, and dress and waist industries, was made with the following objects: (*a*) The selection of a group of shops representing typical illuminating conditions in the industries; (*b*) the formulation of an outline of procedure, permitting the most thorough photometric survey consistent with the time allotted to the inquiry; (*c*) to become familiar with industrial conditions peculiar to the trade having a bearing more or less direct on conditions of illumination.

As a result of this preliminary inspection it was found that a fair idea of prevailing illuminating conditions might be obtained by making a complete photometric survey of 34 shops. Seven of these shops were in the neighborhood of Houston Street west of Broadway, 6 between Houston and Nineteenth Streets, 19 between Nineteenth and Thirty-eighth Streets, and two in the East Side.

Photometric survey.—The photometric survey of the shops selected included the following points: Industry, name of shop, location, state of weather, hour, floor of building, dimensions of shop, orientation, type of window glass and condition of cleanliness, window area, opposite buildings, sky-angle, number of employees, number of working planes, outside illumination, illumination of working planes; character, whether natural, artificial, or combined; dimensions of working planes; location, character, number, and condition of artificial sources; types of reflectors used, albedo of walls, albedo of material, illumination on stairways and approaches. In every instance plans of the shops were made showing the location of the working planes, windows, artificial light units and similar data. In addition to this full notes were made as to any particular condition present affecting the illumination. For a full illustration of the methods employed in collecting these data reference should be made to Appendix B of this report, which contains a reproduction of the survey of shop No. 15.

A complete tabulation of all the data secured will be found in Appendix C.

DISCUSSION OF RESULTS.

In discussing the results of the investigation which are set forth in detail in the tables contained in Appendix C, the points taken up are not necessarily reviewed in the order of their importance because the various factors affecting the illumination of an interior have so many interdependent relations that it is not always possible to weight them according to relative importance. An endeavor has been made to have the discussion follow as nearly as possible the order of the results as arranged in the tables in Appendix C.

Measure of precision of observations.—A very high order of precision was naturally not attainable under the conditions under which the investigation had to be made. Nevertheless, it is thought that the error in the case of constants is not over 1 per cent, that of the variables more than 10 per cent.

While the survey included 34 shops, the tables include observations in a much larger number of workrooms, because several of the firms occupied more than one floor. In computing totals, averages, and percentages, the total number of workrooms, and in some cases the total number of working planes, and not the total number of firms, is considered.

Orientation of windows.—The loft buildings in which workshops of the women's garment industries are housed, in New York City, are, for the most part, situated upon numbered streets. It follows that the greater number of the windows have a northern or a southern exposure. From Table 1 (Appendix C), it is seen that there are almost twice as many windows with north or with south as there are with east or west exposures. Loft buildings on numbered streets, i. e., streets running east and west, usually have windows with these orientations opening on air shafts. Consequently such windows, as a rule, supply but little illumination to the interior. Generally speaking, in workshops of the women's garment industry the windows in the front and rear of loft buildings are those to be relied upon for daylight illumination.

Window glass.—The glass used in workshops of the women's garment trades is usually of one of the following varieties: Plain window glass, factory wire glass, plate glass. With small sky angles such glasses can transmit but a small fraction of the incident light from the sky.

Condition of glass.—The condition of the window glass leaves much to be desired. In 7.5 per cent of the shops the glass was very dirty, in 54.7 per cent it was dirty, in 22.6 per cent it was fairly clean, and clean in only 15.1 per cent of the shops. The glass was considered to be very dirty when it was impossible to define objects seen through it, dirty when a considerable amount of dirt was present, but objects seen through the glass could be still defined, fairly clean when just enough dirt was present to be noticeable, and clean when recently washed.

Sky-angles of workroom windows.—The sky-angle was found to vary widely according to the floor on which the workroom was located as well as for any given floor. This latter variation was due to irregularity in the height of opposite buildings and buildings in which workrooms were located. Generally speaking the sky-angle increased with successive floors, workrooms on upper floors having the largest sky-angles.

Front and rear windows were far more numerous than side windows. On lower floors the sky-angles of front and rear windows were, as a rule, greater than those of side windows but on shops on upper floors large sky-angles were often present for side windows as well.

The following table gives the distribution of sky angle values for 512 front and rear windows and 171 side windows:

TABLE 2.—*Distribution of sky-angle values of windows. Workrooms of the women's garment industries, New York City.*

Sky angle.	Front and rear windows.		Side windows.	
	Number.	Per cent.	Number.	Per cent.
0° to 9.9°	158	30.83	74	43.22
10° to 19.9°	7	1.37	6	3.55
20° to 29.9°	13	2.54		
30° to 39.9°	32	6.25		
40° to 49.9°	16	3.12		
50° to 59.9°	89	17.41		
60° to 69.9°	44	8.59		
70° to 79.9°	27	5.27	32	18.71
80° to 90°	126	24.62	59	34.52
Total	512	100.0	171	100.0

From this table it is seen that the sky-angle in the case of front and rear windows was less than 10° in 30.83 per cent and less than 60° in 61.52 per cent of the cases. There is a wide range of variation in the sky-angles of front and rear windows. In the case of side windows, however, the sky-angle was either low or high, windows with intermediate values being absent. It is clear both from the numbers of each class of windows and the sky-angle value that the front and rear windows were chiefly relied on in the workrooms surveyed for illumination.

As the sky-angle of a window is a measure of the direct sky illumination on the window wall of a building, it follows that, with diminishing sky-angle a progressively greater amount of the daylight illumination of an interior must be derived from reflection from tertiary sources, such as street surfaces and the walls of opposite buildings.

Floors on which workshops are located.—Of interest in connection with the sky-angle is the distribution of the workshops surveyed according to the floors on which they were located.

The following table shows this distribution by floors:

TABLE 3.—*Distribution by floors of shops surveyed in the women's garment trades, New York City.*

Location by floor.	Number of workrooms.	Per cent of workrooms.	Location by floor.	Number of workrooms.	Per cent of workrooms.
Basement	2	4.35	Eighth floor	2	4.35
First floor	1	2.18	Ninth floor		
Second floor	6	13.03	Tenth floor	1	2.18
Third floor	12	26.10	Eleventh floor	1	2.18
Fourth floor	7	15.20	Twelfth floor	1	2.18
Fifth floor	8	17.37			
Sixth floor	4	8.70	Total	45	100.00
Seventh floor	1	2.18			

NOTE.—The discrepancy in the number of workshops (34) in the group surveyed and the number of workshops in this table arises from the fact that some firms occupied more than one floor.

It is seen that location on the third floor was most frequent, followed by the fifth, fourth, and second, in order named. Approximately 72 per cent of the shops surveyed were located on these floors.

Floor area-window area ratio.—The average ratio of floor area to window area in the shops covered by the survey was found to be 10.6:1. The maximum ratio was 30:1, the minimum 3.4:1. The average ratio found is too high to permit good results in the natural illumination of these shops. As previously stated, for satisfactory daylight illumination this ratio should be in the neighborhood of 5:1.

Effective window area.—The average floor area-window area ratio as given above must be still further increased, as this does not correspond to the effective window area. In a large number of workshops in the women's garment trades the front of the loft is occupied by offices, showrooms, and stock rooms. These departments are separated by partitions from the remainder of the loft. It is also a common practice to separate the cutting department from the rest of the workshop by partitions frequently reaching the ceiling. A large part of the total window area is cut off from the workrooms by these partitions. The windows so cut off are almost invariably those having the largest sky angles. Owing to these circumstances the average ratio of effective window area to total window area was found to be 0.82, with a maximum of 1 and a minimum of 0.49. The above-mentioned conditions have the effect of raising the floor area-effective window area ratio to 12.9:1, with a maximum of 36.6:1 and a minimum of 4.1:1.

Albedo (reflection coefficient) of walls and ceilings.—The interior walls of 80.5 per cent of the workshops were white. The finish was usually plaster or alabastine with a mat surface. The following table shows the albedo of the walls of the various shops in the survey:

TABLE 4.—*Albedo of walls and ceiling, workshops of women's garment trades, New York City, N. Y.*

Albedo.	Walls having albedo between.	Per cent.	Ceiling having albedo between.	Per cent.
90–80	13	33.4	13	44.8
79–70	9	23.1	6	20.7
69–60	8	20.5	6	20.7
59–50	1	2.56	2	5.90
49–40	1	2.56	1	3.45
39–30	1	2.56	....	....
29–20	....	....	....	....
19–10	6	15.4	1	3.45
Total	39	100	29	100

Reference to this table shows that 33.4 per cent of the walls measured reflected 80 per cent or over of the incident light and that 44.8 per cent of the ceilings had a similar albedo. The average albedo of the walls was 65 per cent; that of the ceilings 73 per cent.

When the walls were colored the albedo was naturally much lower than that of white walls.

The ceilings of 69.6 per cent of the shops were white, the finish, for the most part, being mat alabastine on plaster. Reference to Table 1 (Appendix C) shows that walls and ceilings with an alabastine surface have the highest albedo, with whitewash and white paint next in order in percentage of light reflected.

Albedo of material worked upon.—The amount of light reflected by the material worked upon is of importance in determining what constitutes adequate illumination for any industrial process. When the reflection coefficient of the material is low more light is needed. This is especially true in the garment trades as the materials worked upon are spread out so as almost or entirely to cover the working plane. The albedo of the materials used was determined in the case of a large number of samples.

The following table gives the approximate albedo of some of the materials commonly worked with in the shops surveyed:

TABLE 5.—*Albedo of materials commonly worked upon in workshops of the women's garment trades, New York City.*

Material.	Albedo.	Material.	Albedo.
	Per cent.		*Per cent.*
Balck velvet	0.37	Black silk and mercerized cotton	4.5
Navy blue woolen cloth (dark)	1.7	Green (light), woolen or cotton	5.4
Black woolen cloth	1.9	Brown woolen cloth (light)	10.9
Navy blue woolen cloth (light)	2.2	Tango cloth, woolen or cotton	14.3
Green, Russian (dark), woolen or cotton	2.3	Light brown paper patterns	35.1
Brown woolen cloth (dark)	2.3	White cloth [1]	65.9
Black cotton cloth	2.9		

[1] The albedo of white cloth depends largely upon its thickness, together with the color of the surface upon which it is placed. The albedo given is for a double thickness of cloth lying on a golden-oak colored surface.

As shown by the table the albedo of the materials varies over a wide range. In general, it may be stated that the albedo of material used in the cloak, suit, and skirt workshops is the lowest; that in dress workshops the next, and that in waist workshops the highest in order.

Working planes.—Photometric measurements were taken at the following working-planes which cover practically all the stations at which work is carried on in the women's garment industries: Cutting tables, pressing tables, sewing machines, buttonhole machines, finishing tables, basting tables.

A complete tabulation of the data secured appear in Appendix C, under corresponding headings. In all, photometric measurements were taken on 69 cutting tables employing 150 cutters, 47 pressing tables on which 228 pressing boards were mounted, 95 banks of sewing machines containing 851 machines, 20 buttonhole machines, 131 finishing tables employing 610 finishers and 43 basting tables which are used as required by operators.

In addition to this the general illumination of shops and of stairways was measured.

In view of the fact, shown in the preceding portion of this report, that workers in the garment industries are divisible into certain groups according to their work, conditions of illumination at the various stations just enumerated will affect only that particular group of workers performing the type of work in question. It is, therefore, necessary at the risk of some repetition to discuss the data presented in this report in relation to each of the groups of working planes mentioned.

Extent of artificial illumination.—In no shops surveyed was entire reliance placed upon artificial sources for illumination. All shops, however, were equipped with means for artificial lighting. Under certain conditions such as at the close of winter days and for overtime work the artificial lighting system becomes the only source of light. It was frequently the case under usual working conditions while at some of the stations the daylight illumination was adequate; at others in the same shop additional light had to be supplied from artificial sources.

The following table gives the percentages of the workrooms measured, in which under usual working conditions working planes were illuminated (*a*) by daylight alone and (*b*) by combined artificial and day light. It should be stated that owing to the summer season of the year in which these measurements were made, in the winter, the percentage of stations using artificial light would undoubtedly be increased.

TABLE 6.—*Percentage of shops in which working planes were illuminated by daylight and by combined artificial and day light.*

Working plane.	Number of workrooms or working planes.	Daylight alone.		Artificial light and daylight.	
		Number.	Per cent.	Number.	Per cent.
Cutting tables	69 tables	56	81.2	13	18.8
Pressing tables	38 workrooms	30	79.0	8	21.0
Machines	44 workrooms	42	95.5	2	4.5
Buttonhole machines	15 workrooms	14	93.3	1	6.7
Finishing tables	37 workrooms	36	97.3	1	2.7
Basting tables	38 tables	27	71.0	11	29.0
DESIGNING DEPARTMENTS.					
Design cutting tables	13 tables		100.0		
Design pressing tables	6 tables		100.0		
Design machines	9 workrooms		100.0		
Design finishing tables	6 tables		100.0		

Artificial light was used habitually throughout the day at some working plane in 23 per cent of the workrooms surveyed.

ILLUMINATION OF CUTTING TABLES.

Cutters are an important group of workers in the women's garment industries. Much of the fit and style of the finished product depends upon the accuracy of their work. Minor degrees of carelessness on their part are sufficient to produce waste of valuable material. The necessity for laying out patterns upon dark materials, determining the right side of fabrics presenting but little differences in their inner and outer surfaces, following guide marks over checked, or particolored fabrics, all demand close attention and vigilance on the part of the worker. Not only do poor illuminating conditions at cutting tables react adversely upon the worker, but they are likely to be a source of considerable loss to the employer owing to mistakes arising from imperfect illumination of the material worked upon.

Arrangement of tables.—Cutting tables were variously located in shops according to whether daylight, artificial light, or combined artificial and natural illumination was adopted.

There were 3 general arrangements of cutting tables, as follows, which give different characteristics so far as daylight illumination is concerned: (1) Tables situated in close proximity and perpendicular to a window; (2) tables situated in close proximity and parallel to windows; (3) tables not in close proximity to windows and, for the sake of convenience, said to be in the center of the shop.

The distribution of cutting tables according to this classification was as follows: Perpendicular to windows, 46.1 per cent; parallel to windows, 21 per cent; center of shop, 32.9 per cent.

As cutting tables are long, over 30 feet on the average, it is evident that their location either perpendicular or parallel to windows will markedly affect the illumination of the table.

The following figures show the respective characteristic daylight illumination gradients for cutting tables perpendicular to windows, parallel to windows, and centrally located:

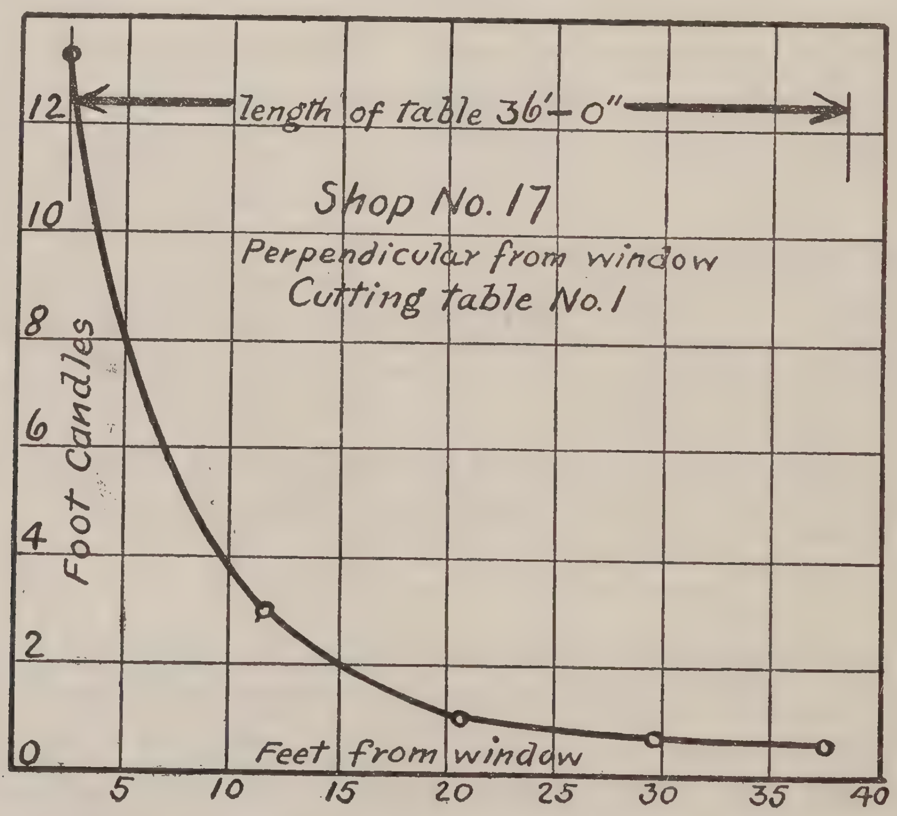


FIG. 7.—Characteristic illumination gradient, cutting table, in proximity to and perpendicular to windows.

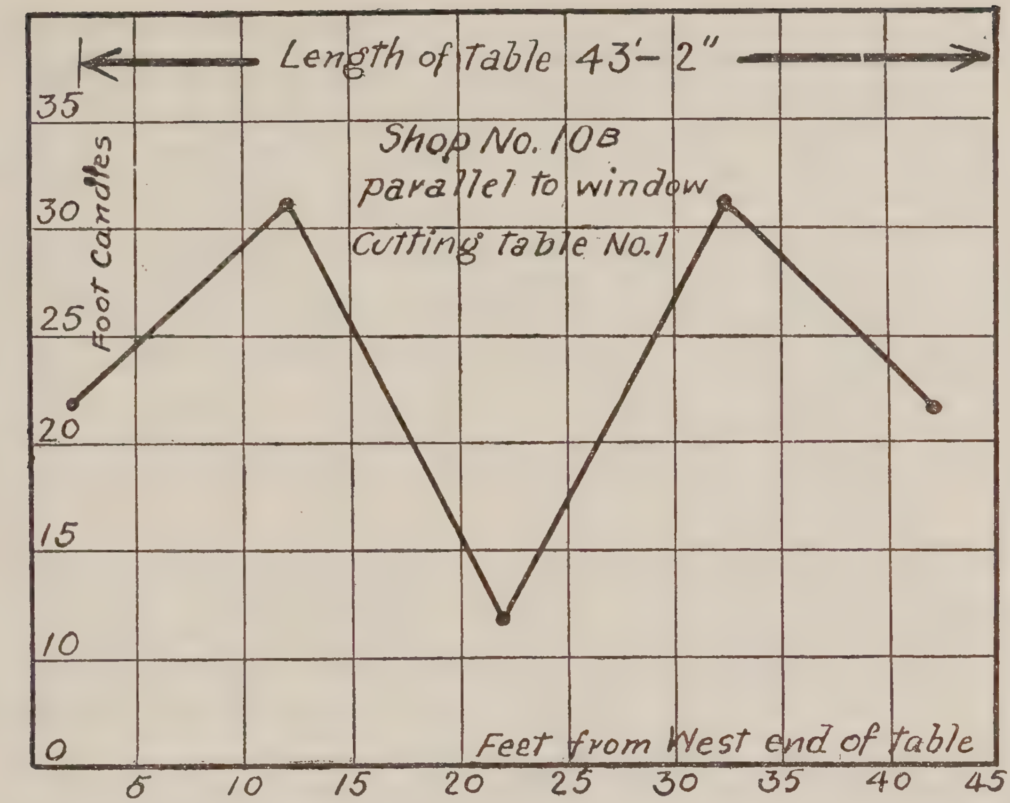


FIG. 8.—Characteristic illumination gradient, cutting table parallel to window.

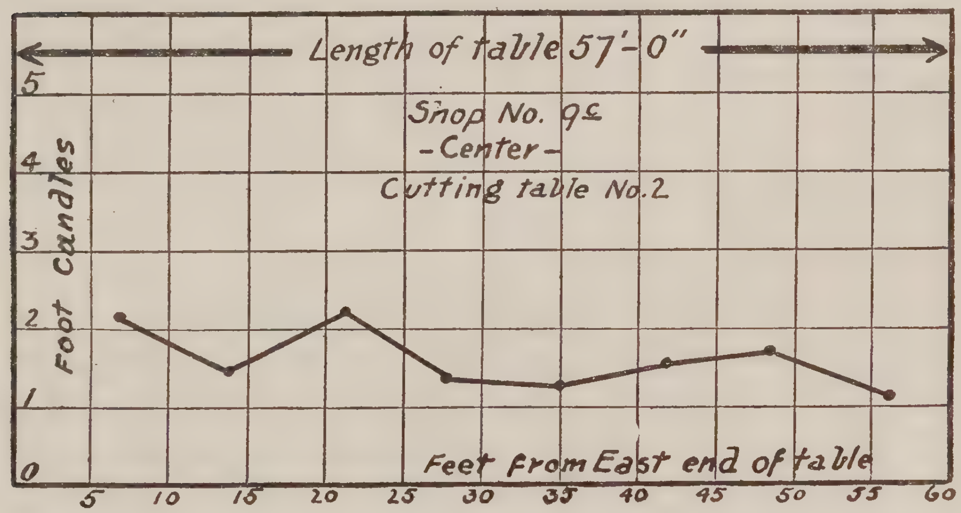


FIG. 9.—Characteristic illumination gradient, cutting table in center of shop.

An inspection of these figures shows how rapidly the illumination falls off as the distance from the window increases in the case of tables perpendicular to windows. In the parallel arrangement the illumination increases and diminishes according to the relative position of the station to the window.

In the case of cutting tables, centrally disposed, only a small portion of the light received comes directly from the window. Such tables are illuminated by the light reflected from tertiary sources, such as walls and ceilings. This makes for a more even distribution of the light than in the case of tables by windows, but, as shown in the instance on the chart, the illumination is likely to be inadequate.

In the case of tables placed perpendicular to the windows, while the illumination at the window end is adequate, the distribution is poor, owing to rapid fall of the gradient as the distance from the window increases. The absolute value of illumination on the most distant parts of the table was in most cases adequate.

The distribution of the illumination on cutting tables placed parallel to windows is not uniform, as shown in the chart, but in general the absolute values of the illumination on all parts of the table were adequate.

The average illumination on 46.7 per cent of the tables perpendicular to the windows was below 5 foot-candles, or the minimum to insure favorable working conditions.

On tables parallel to the windows the illumination was below this minimum on 43.7 per cent and on tables centrally located 96 per cent. Artificial illumination was used in the case of 16.7 per cent of tables perpendicular to windows, on 12.5 per cent of tables parallel to windows, and on 25 per cent of center tables.

From a consideration of the distribution curves alone, of the illumination on cutting tables, it would seem that, generally speaking, location of the table near and parallel to windows would be the most advantageous. Such an arrangement, however, is disadvantageous for cutters facing the windows, as they are then subject to glare from the window, which would have the effect of reducing visual acuity, especially when working with dark materials.

Artificial illumination of cutting tables.—Where artificial illumination was used (approximately 17 per cent of the tables) the relative position of tables to windows made but little difference. The general methods found employed was that of local illumination. This method requires the use of units consisting of lamps and reflectors of correct size and distribution characteristics, together with symmetrical suspension over the table of the units at such height as to give the best results with respect to economy, uniformity of distribution, and avoidance of glare.

It is evident, however, from the study of Tables 1 and 2 (Appendix C) that with but few exceptions there had been little effort made to conform with these requirements. The most usual error made in the workshops surveyed was the use of units consisting of lamps and reflectors not suited to each other. Thus 100-watt tungsten lights were frequently combined with reflectors designed for 40 or 60 watt lamps. It is needless to say that not only does the use of lamps larger than those for which the reflector is designed reduce greatly the efficiency of distribution of the reflector, but glare effects are usually caused by the projecting portion of the lamp.

Distribution.—Where electricity was employed, the average number of outlets to each cutting table was found to be 2.7. As the average wattage of each outlet was 93.5 watts and the average dimensions of cutting tables were 30.6 by 5.5 feet, the average watts per square foot of table area was 1.49. Ordinarily this is sufficient to secure adequate illumination, provided units are properly located and reflectors are suited to the lamps employed. Owing, however, to faulty combinations of lamps and reflectors, the illumination was found to be generally inadequate, being below 5 foot-candles on 69.3 per cent of the cutting tables illuminated by electricity.

Gas illumination.—Gas was used in the artificial illumination of 3 or 23 per cent of the cutting tables artificially illuminated. Flat-flame burners were used once, Welsbach burners once, and a combination of both once. The illumination fell below 5 foot-candles in all three instances of cutting tables illuminated by gas.

Although all the shops surveyed are supplied with electric current for driving machines, gas was used under the impression that ''it was cheaper than electricity.'' This is true when properly designed Welsbach burners are employed and maintained. When units of the flat-flame type, however, are used gas costs twice as much, basing the cost of gas at 90 cents per 1,000 cubic feet, and electricity at 10 cents per kilowatt hour, using tungsten lamps.

Glare.—Glare effects were present from 87.2 per cent of the lamps in use at artificially illuminated cutting tables. This high percentage is due to the following circumstances:

1. The low average angle of glare of 47°.
2. The use of reflectors which in 66 per cent of the instances where they were employed were too small for the lamps, so that portions of the filament projected beyond the edge of the reflector.
3. The fact that 31.7 per cent of the reflectors used were of the shallow saucer type.
4. The use of bare lamps in 29 per cent of the instances.

Such conditions combined with small glare-angles produce marked glare effects.

General comment on the illumination of cutting tables.—The following table shows the prevailing intensities of illumination on 69 cutting tables for which this data was compiled.

TABLE 7.—*Prevailing intensity of illumination (by tables) on cutting tables, women's garment industries, New York City.*

Foot-candles.	Average.				Maximum.				Minimum.			
	Combined daylight and daylight and artificial light.	Daylight and artificial light.	Per cent; combined daylight and daylight and artificial light.	Per cent daylight and artificial light.	Combined daylight and daylight and artificial light.	Daylight and artificial light.	Per cent; combined daylight and daylight and artificial light.	Per cent daylight and artificial light.	Combined daylight and daylight and artificial light.	Daylight and artificial light.	Per cent; combined daylight and daylight and artificial light.	Per cent daylight and artificial light.
Below 0.01	0	0	0	0	0	0	0	0	0	0	0	0
0.01–0.099	1	0	1.45	0	0	0	0	0	4	1	5.80	7.7
0.1–0.99	7	1	10.14	7.7	7	1	10.14	7.7	27	6	39.10	46.1
1–1.99	16	2	23.20	15.3	5	0	7.25	0	18	4	26.10	30.8
2–2.99	6	1	8.70	7.7	10	2	14.47	15.3	6	1	8.70	7.7
3–3.99	7	5	10.14	38.5	4	0	5.80	0	4	1	5.80	7.7
4–4.99	6	3	8.70	23.1	4	3	5.80	23.1	0	0	0	0
5–9.99	8	1	11.61	7.7	12	3	17.4	23.1	4	0	5.80	0
10–19.99	7	0	10.14	0	8	4	11.60	30.8	5	0	7.25	0
20–49.99	10	0	14.47	0	11	0	15.94	0	1	0	1.45	0
50 and over	1	0	1.45	0	8	0	11.60	0	0	0	0	0
Total	69	13	100.0	100.0	69	13	100.0	100.0	69	13	100.0	100.0
Tables on which illumination was under 5 foot-candles	43	......	[1] 62.3	....	30	......	[1] 43.5	....	59	......	[1] 85.5	....
Tables with artificial light in which illumination was under 5 foot-candles	......	12	....	[1] 92.3	......	6	....	[1] 46.1	......	13	[1] 100.0	....

[1] Per cent.

This table shows the percentage distribution of intensities of illumination by cutting tables. The average illumination on 62.3 per cent of the cutting tables was below 5 foot-candles. The average illumination produced by a combination of daylight and artificial light was below 5 foot-candles on 92.3 per cent of the tables lighted in this way. Variations in uniformity of distribution are also indicated by the fact that the minimum illumination on 85 per cent of the cutting tables was less than 5 foot-candles. Indeed, on some cutting tablest he lack of uniformity in distribution was such that the illumination might be 50 to 60 times greater at one station than at another.

PRESSING BOARDS.

Illumination data were secured in the case of 47 tables on which 228 pressing boards were mounted. The work of pressers, as the name indicates, consists in pressing garments as required. The work makes less demand upon the eyes than the other processes concerned in the manufacture of garments. While the illumination necessary to this class of work should be adequate, the necessity for optimum conditions is not so urgent as is the case with workers who use their eyes under the exacting demands made by other types of work in the women's garment industry.

Intensities of illumination.—The following table shows the prevailing intensities of illumination on pressing boards as shown by the measurements:

TABLE 8.—*Prevailing intensities of illumination (by boards) on 175 pressing boards.*

Illumination in foot-candles.	0.01–0.099	Per cent.	0.1–0.99	Per cent.	1–1.99	Per cent.	2–2.99	Per cent.
Number of boards	0	0	41	23.4	18	10.3	22	12.6
Average foot-candles on boards	....	....	0.521	....	1.38	....	2.54	....

Illumination in foot-candles.	3–3.99	Per cent.	4–4.99	Per cent.	Total.	Per cent.	5–9.99	Per cent.
Number of boards	11	6.3	9	5.2	101	57.7	37	21.7
Average foot-candles on board	3.39	....	4.48	....	1.78	....	6.64	....

Illumination in foot-candles.	10–19.99	Per cent.	20–49.99	Per cent.	50 and over.	Per cent.	Total.	Per cent.
Number of boards	16	9.1	16	9.2	5	2.9	175	100
Average foot-candles on board	13.8	....	35.4	....	91.5	....	9.56	....

From this table it is seen that the average illumination on 57.7 per cent of the pressing boards was below 5 foot-candles. Where combined artificial and natural lighting was used (31 per cent of the pressing tables) the illumination was below 5 foot-candles on 75 per cent of the pressing boards.

Minimum illuminations of less than 5 foot-candles on pressing boards were present in 79 per cent of the shops using daylight alone for their illumination, and in all the shops where combined artificial and day light were used.

Artificial illumination.—Artificial illumination was used habitually at 15 out of 47 pressing tables measured, or 31 per cent. Of these electricity was used in 14 instances and gas (flat flame) once. The same faults in regard to improper distribution of units, use of incorrect combinations of reflectors and lamps, or the use of bare lamps discussed in the case of cutting tables, were common in the artificial illumination of pressing tables.

Glare effects.—So far as daylight was concerned 15 per cent of the pressing tables were located adjacent and parallel to windows. Pressers facing the window would be subject to glare from this source which, however, would not interfere with their work to the same extent as it would in operations requiring a closer use of the eyes.

In the case of tables artificially lighted glare effects were present from 90.5 per cent of the units which were in operating condition.

The causes of glare effects were the same as for cutting tables.

While with the presser in his usual ironing position, looking down at the board, the average glare angle was 84°, this angle is decreased to about 25° to 30° whenever the presser is engaged in other operations than ironing. Of the reflectors employed, 62.3 per cent were of the shallow saucer type affording no protection from glare. Of the total number of reflectors used, 83.6 per cent were used in combination with lamps so large that the incandescent filament projected beyond the edge of the reflector. The average height of suspension of the units from the floor was 6.4 feet. The average height of pressers is 5.5 feet. There was, therefore, only a difference of 0.9 of a foot between the average height of suspension of the units and that of the workers. As the units were usually suspended over the center line of the tables, which averaged 5.6 feet in width, the combination of naked lamps with low suspension can produce striking violations of hygienic principles in illumination by reason of glare.

Thus, in one instance the light was furnished by a naked 250-watt tungsten lamp suspended over the center line at a distance of but 6 feet from the floor to the socket. As this lamp is about 10 inches in length, the brightest part of the filament was nearly in line with and close to the workers' eyes whenever their position was erect.

It is needless to say that the glare effect from a source of such high intrinsic brilliancy, placed in proximity to the eye of the worker is highly injurious to vision.

Comment on distribution of artificial light on pressing tables.—The average length of pressing tables is 14.8 feet, their average width 5.6 feet. The average number of boards per table was found to be 4.8, their average length 3.2 feet. As it was customary to arrange the pressing boards on opposite sides of the table there were, thus, 2.4 boards to each linear 14.8 feet of table. The average number of outlets per table was 2.1 and consequently 0.44 outlets for each board. For uniform distribution of light there should be 0.5 outlets per board. As there were several tables included in the measurements on which there were but a single row of boards and others in which the double row arrangement was incompletely carried out, the average number of 0.44 outlets per board does not actually approach the theoretical requirements so nearly as seems to be the case.

The average ratio of table area to board area is 6.3 : 1. There is thus a considerable amount of waste space which must be lighted in order to illuminate pressing boards. The average watts expended per square foot of pressing boards was 17.4, while for the table this was 2.7. This figure could be materially reduced by lowering the ratio of table area to board area which is needlessly high.

Gas illumination.—Although gas was habitually used in the case of only one of the tables surveyed, provision for illumination with gas was made at 18 per cent of all the boards. Of such boards the flat gas flame was the illumination provision in 67.4 per cent of the instances.

SEWING MACHINES.

Operators are numerically the largest class of garment workers. Being pieceworkers, their ability to earn a high wage depends to a great extent upon the skill and celerity of their movements. The sewing machines are electrically driven and operate at a high rate of speed. Accuracy in following the outline of patterns and in sewing seams straight are essential in the work of the operator, as much of the quality of fit and style of the garments depends on care in these particulars. The work, therefore, demands concentration. The need for vigilantly watching the flying needle point calls for good lighting conditions, absence of moving shadows, together with freedom from shadows and maximum illumination at the needle point.

Illumination data were secured on 95 banks of sewing machines containing 851 sewing machines. The necessity for trying to provide good illuminating conditions for machines is recognized by shop owners, hence no banks of machines were found centrally located, all being situated in proximity to windows, either perpendicular or parallel to them.

Seventy-four and eight-tenths per cent of the banks of machines measured were perpendicular to windows and 25.2 per cent were parallel to them. The most usual arrangement of machines was, therefore, perpendicular to the windows. Operators sit at opposite sides of machine tables, the machines being driven either from a shaft running below the table or by individual electric drive. The machines are staggered so that operators on opposite sides of the table do not interfere with each other.

Perpendicular arrangement of machines.—While, so far as freedom from glare effects is concerned the arrangement of machines perpendicular to windows is preferable, it has the disadvantage, however, of rapid fall in illumination gradient, so that the daylight illumination on a long bank of machines perpendicular to a window will, in many instances, be inadequate. With short banks, however, this is not the case. The deficiency can be supplemented in the case of long banks by auxiliary artificial illumination.

The following chart shows the rapid fall in the gradient of illumination on machines placed perpendicular to windows:

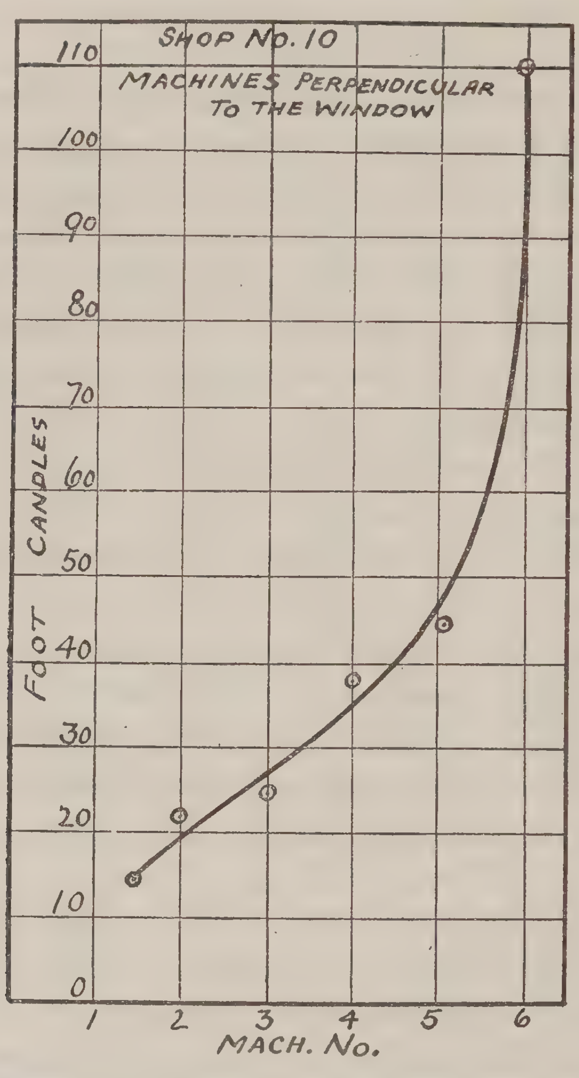


FIG. 10.—Fall in illumination gradient on sewing-machine banks placed perpendicular to window.

Parallel arrangement of machines.—When machines are placed parallel to windows the illumination is more favorable for operators with their backs to the windows. Those facing the windows have their visual acuity reduced by glare effects. As shown in the following chart the distribution of illumination is fluctuating according to the position of the machine either opposite a window or wall space.

This arrangement also requires considerable aisle space between the machines and the window wall. Inasmuch as machines are usually located in the backs of shops (the front being occupied by showrooms and offices), the sky angle at the rear is usually small because of narrow alleys, courtyards, and tall buildings. Reflection from the walls of opposite buildings, therefore, plays a considerable part in the natural illumination of the machines. It is the common practice of operators sitting with their backs to windows to pile garments on the window sills. In this way useful portions of windows are obstructed, with the result of a considerable reduction of the available illumination. In the perpendicular arrangement of machines, operators have no access to the window sills for this purpose.

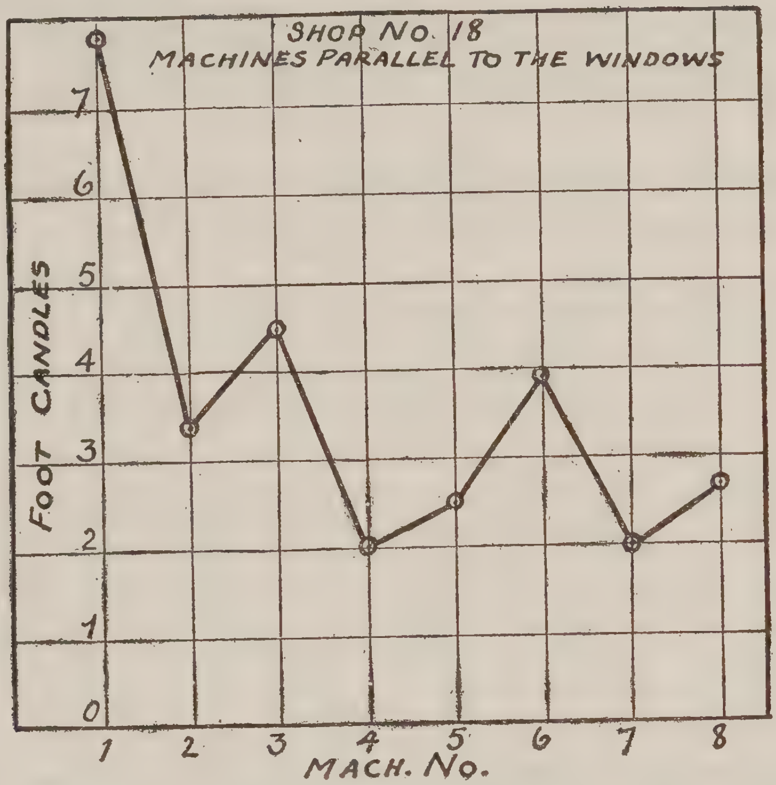


FIG. 11.—Illumination gradient of sewing-machine banks parallel to windows.

Prevailing intensities of illumination on machines.—The following table shows the prevailing intensities of illumination on machines, by shops:

TABLE 9.—*Prevailing intensities of illumination upon sewing machines (by shops), women's garment industries, New York City.*

Foot-candles.	Average.				Maximum.				Minimum.			
	Combined daylight and daylight and artificial light.	Per cent.	Daylight and artificial light.	Per cent.	Combined daylight and daylight and artificial light.	Per cent.	Daylight and artificial light.	Per cent.	Combined daylight and daylight and artificial light.	Per cent.	Daylight and artificial light.	Per cent.
Below 0.01	0	0	0	0	0	0	0	0	0	0	0	0
0.01–0.099	0	0	0	0	0	0	0	0	3	6.81	0	0
0.1–0.99	5	11.37	0	0	4	9.11	0	0	13	29.51	0	0
1–1.99	4	9.11	0	0	0	0	0	0	4	19.11	0	......
2–2.99	2	4.55	0	0	1	2.27	0	0	3	6.82	0	0
3–3.99	2	4.55	0	0	0	0	0	0	1	2.27	0	0
4–4.99	1	2.27	0	0	2	4.55	0	0	4	9.11	1	50.0
5–9.99	6	13.60	0	......	8	18.15	0	0	5	11.36	0	0
10–19.99	10	22.70	1	50.0	4	9.10	1	50.0	7	15.90	0	0
20–49.99	11	25.00	0	0	11	25.00	0	0	4	9.11	1	50.0
50 and over	5	6.85	1	50.0	14	31.82	1	50.0	0	0	0	0
Total	44	100.00	2	100.0	44	100.0	2	100.0	44	100.0	2	100.0
Shops in which illumination was under 5 foot-candles	14	31.85	0	0	7	15.93	0	0	29	63.63	1	50.0
Shop with artificial light which was under 5 foot-candles	......	......	....	0	....	....	....	0	......	....	1	50.0

From this table it appears that in 68.2 per cent of the shops the illumination on machines at the needle plane was 5 foot-candles or over. In 31.8 per cent of the shops the average illumination on machines at the needle plane was below 5 foot-candles.

Turning now to the average prevailing illumination on individual machines, the following table gives these data:

TABLE 10.—*Prevailing intensities of illumination on machines (by machines), women's garment industries, New York City.*

Illumination in foot-candles.	0.01–0.099	Per cent.	0.1–0.99	Per cent.	1–1.99	Per cent.	2–2.99	Per cent.	3–3.99	Per cent.	4–4.99	Per cent.
Number of machines	4	0.93	67	15.5	44	10.2	27	6.26	27	6.26	23	5.32
Average illumination in foot-candles	0.085	......	0.512	......	1.39	......	2.40	......	3.36	......	4.41	......

Illumination in foot-candles.	5 9.99	Per cent.	10–19.99	Per cent.	20–49.99	Per cent.	50 and over.	Per cent.	Total.	Per cent.
Number of machines	58	13.41	67	15.5	80	18.51	35	8.12	432	100
Average illumination in foot-candles	7.12	....	13.5	....	31.9	....	76.4	......	16	......

Number of machines on which the illumination was below 5 foot-candles, 192, equals 44.47 per cent.

Average illumination on 192 machines on which the illumination was below 5 foot-candles, 1.83 foot-candles.

It is seen by this table that on 55.5 per cent of the machines the illumination was 5 foot-candles or above. On 44.5 per cent of the machines the illumination was below 5 foot-candles, the average being 1.8 foot-candles.

Distribution of daylight illumination on machines.—From a study of the illumination gradient curves for typical banks of machines it is seen that banks arranged perpendicular to windows with from 6 to 8 machines to a bank have on the whole a better illumination distribution than banks of machines parallel to windows. For longer banks this does not hold good on account of the rapid fall in illumination as distance from the window increases.

Artificial illumination.—While means for artificial illumination of machines are always provided, in only two of the workshops surveyed was such illumination habitually used to supplement daylight. The same statement applies, however, to machines as to other working planes, namely, that during the winter and at overtime work it will be necessary to use artificial light more frequently than during the season when this survey was made. The question of artificial illumination of machines is consequently of greater importance than would be indicated by the actual number of shops surveyed found habitually using artificial illumination in the lighting of machines. The methods in general use in the workshops surveyed, therefore, merit discussion.

General methods for artificial illumination of machines in workshops.—The general method employed is that of intense local illumination. Two such methods are usual: (1) Lamps arranged along the center line of machine tables, spaced from 4 to 8 feet from centers; (2) lamps arranged in double rows along machine tables spaced 4 feet on centers.

The first method, center line location, is employed by 61.5 per cent of the shops surveyed, and the second, double row location, in 37.8 per cent of the shops.

Neither of these methods can be relied upon satisfactorily to illuminate sewing machines. Owing to the construction of machines and the necessity for concentration of illumination and for absence of shadows at the needle point, there is but one practical way of meeting these exacting requirements, namely, the installation of one unit for each machine. Such unit should be firmly fixed so that it will not vary from its correct position. It should be so placed that shadows of the various machine parts will not fall on the needle plane. It should consist of a suitable lamp and a reflector which will protect the eyes of the worker from glare effects. Such units should be of durable construction, readily accessible for cleansing and renewal to persons to whom this duty is assigned and so secured that operators have no control over them except to light or extinguish them.

Reflectors used.—From Table 14, Appendix C, it will be seen that 97 per cent of the reflectors used were of the deep-bowl type, the saucer type, so common at other working planes, constituting but 3 per cent. It would seem that shopowners by reason of the types of reflector selected realized the importance of protecting the eyes of workers from glare in the case of machine operators. Unfortunately many of these reflectors were installed in the days of 16 candlepower carbon lights. Since the introduction of tungsten lights, the fact that these give more light for less money has brought about the general replacement of carbon lamps by lamps of this type. Now, 16.9 per cent of all lamps installed at machines were 100-watt and 20.3 per cent were large size, 60-watt tungstens. As a consequence the reflectors designed for carbon lamps were too small for lamps of this kind, so that the efficiency of distribution of the reflectors was reduced and glare effects were present whenever the lamps were lit.

Glare effects.—As 25.2 per cent of the banks of machines were disposed parallel to windows, operators facing windows were subject to varying glare effects. So far as artificial illumination is concerned glare effects were present in the case of 69.2 per cent of the units which would light.

The average glare angle was 72°. This was subject to a decrease of from 40° to 50° when the operator made machine or cloth adjustments.

In calculating the angle of glare given it was assumed that the average height of the eye above the needle plane was 12 inches. The average height of suspension of the units above the machine table was 2.1 feet. While only 3 per cent of the reflectors used were of the shallow-saucer type, the use of 60 and 100 watt tungsten lamps in bowl reflectors designed for 16 candlepower carbon lights is a prominent cause for glare effects whenever it becomes necessary to use artificial illumination.

FINISHING TABLES.

Finishers, as their name implies, add the finishing touches to garments received from the operators. The tables at which they work serve only to hold supplies (buttons, needles, thread, and the like), the work being held in the lap.

Photometric measurements were taken on 131 finishing tables employing 610 finishers. All finishing work is handwork. On the whole it appears to involve greater strain upon the vision than the duties of the other workers in this industry. Hence the necessity for adequate illumination.

Arrangement of finishing tables.—As was the case with cutters and pressers, three general types of arrangement of finishing tables were found, perpendicular and close to windows, parallel and close to windows, and centrally located. Their location was distributed as follows: Perpendicular to windows, 32.1 per cent; parallel to windows, 8.4 per cent; centrally located, 59.5 per cent. The illumination gradients with respect to these positions had naturally the characteristics previously explained.

Prevailing intensities of illumination on finishing tables.—The following table shows the prevailing intensities of illumination on finishing tables by spaces occupied by one finisher:

TABLE 11.—*Prevailing intensities of illumination on finishing tables (by unit spaces), women's garment industries, New York City.*

Foot-candles.	Combined daylight and daylight and artificial light.	Per cent.	Daylight and artificial light.	Per cent.
0.1–0.99	19	11.25	0	0
1–1.99	21	12.43	1	12.5
2–2.99	21	12.43	0	0
3–3.99	11	6.51	1	12.5
4–4.99	13	7.70	2	25.0
Below 5	85	50.32	4	50.0
5–9.99	35	20.70	3	32.5
10–19.99	19	11.25	1	12.5
20–49.99	11	6.51	0	0
50 and above	19	11.25	0	0
Total	169	100.00	8	100.0

From this table it is seen that the illumination was below 5 foot-candles at 50.32 per cent of the stations at which finishers worked. It is thus seen that a little over one-half the working stations of finishers the illumination fell below the minimum required for favorable conditions. In view of the demands finishing work makes upon the eyes, it is especially important, in the case of finishers, to insure them adequate conditions of illumination.

Artificial illumination.—At the time of the survey artificial illumination was habitually employed at finishing tables in but one of the 34 garment factories surveyed. As is the case at other working planes, means for artificial illumination is provided. We must also assume, that owing to the season of the year at which the survey was made that, during the winter months resort must frequently be had to artificial lighting. The means for artificial lighting of finishing tables was electric in 24 or 66.7 per cent, Welsbach gaslights in 3 or 8.36 per cent, flat-flame gas burners in 4 or 11.2 per cent, combination of Welsbach and flat-flame gaslights in 1 or 2.8 per cent, and in 4 or 11.2 per cent of the cases there was no provision made for artificial light. Intense local lighting was the general method employed, the units being suspended over the center line of the table.

Reflectors used.—The type of reflectors used varied considerably. From Table 13, Appendix C, it is seen that 67.5 per cent of the reflectors used were of the deep bowl or cone type and 37.5 per cent of the shallow saucer type; 35.6 per cent of the total number of units used in the artificial illumination of finishing tables consisted of naked lamps. Where reflectors were used, the mistake, so frequently mentioned in foregoing pages, of using lamps too large for the reflectors, was, besides the use of naked lamps, a common source of glare effects.

Drop-cord suspension was employed at 68.3 per cent of the finishing tables, all such installations being provided with means for adjusting the height. At the remaining 31.7 per cent of the finishing tables fixed suspension units were installed.

The use of adjustable drop-light suspension is objectionable in that it permits alterations in the distribution of the unit at the will of workers who are naturally not versed in the requirements for a correct distribution of light and prevention of glare. In many instances the result of adjustments on the part of the workers had lowered the efficiency of distribution of the reflector and the angle of glare.

Glare effects.—Eight and four-tenths per cent of the finishing tables were located parallel to windows, with the usual result of subjecting workers facing the window to varying glare effects. Glare effects were produced in the case of 97.7 per cent of artificial sources which were in operating condition.

The causes for this large percentage of glare effects were those already alluded to, namely, an average angle of glare of 95°, which would be decreased by approximately 50° whenever the worker looked up from his lap to select supplies from the table, the use of bare lamps or flat-flame gas burners, saucer reflectors, and lamps too large for reflectors.

BASTING TABLES.

Basting tables are large tables used by machine operators on which to baste garments. Because of the large stitches, temporary character of the work, and the fact that the tables are used only a part of the time, they are generally placed in the most unfavorable parts of the shop so far as daylight is concerned. Daylight alone was used on 29, or 67.5 per cent, of the basting tables included in the survey, and combined artificial and daylight illumination on 14, or 32.5 per cent.

The following table gives the prevailing intensities observed:

TABLE 12.—*Prevailing intensities of illumination on basting tables, women's garment industries, New York City.*

Foot-candles.	Average.				Maximum.				Minimum.			
	Combined daylight and daylight and artificial light.	Per cent.	Daylight and artificial light.	Per cent.	Combined daylight and daylight and artificial light.	Per cent.	Daylight and artificial light.	Per cent.	Combined daylight and daylight and artificial light.	Per cent.	Daylight and artificiall ight.	Per cent.
Below 0.01	0	0	0	0	0	0	0	0	0	0	0	0
0.01–0.099	0	0	0	0	0	0	0	0	0	0	0	0
0.1–0.99	11	26.20	0	0	8	20.00	0	0	19	48.72	3	21.42
1–1.99	12	28.60	5	28.71	9	22.50	0	0	14	35.92	6	42.86
2–2.99	8	19.01	2	14.28	5	22.50	6	42.83	1	2.56	1	7.16
3–3.99	3	7.15	2	14.28	9	12.50	0	0	2	5.12	1	7.16
4–4.99	1	2.38	1	7.16	1	2.50	1	7.16	3	7.68	3	21.40
5–9.99	5	11.90	4	28.57	5	12.50	5	35.72	0	0	0	0
10–19.99	0	0	0	0	3	7.50	2	14.29	0	0	0	0
20–49.99	1	2.38	0	0	0	0	0	0	0	0	0	0
50 and over	1	2.38	0	0	0	0	0	0	0	0	0	0
Total	42	100.0	14	100.0	40	100.0	14	100.0	39	100.0	14	100.0
Tables on which illumination was less than 5 foot-candles	35	83.43	11	71.43	32	80.00	7	49.99	39	100.0	14	100.0
Tables with artificial light on which illumination was less than 5 foot-candles	....	....	11	71.43	....	....	7	49.99	....	....	14	100.0

Reference to this table shows that on 83.4 per cent of the basting tables the average illumination was below 5 foot-candles. At tables where combined artificial and daylight illumination was employed the illumination fell below 5 foot-candles in 71.4 per cent of the instances. We thus see that the illumination of basting tables is very generally inadequate. Yet there are cogent reasons for the adequate illumination of basting tables.

While the work done at these tables is of a temporary character, and the stitches large, the accurate adjustment of the pieces of cloth to each other and the distinguishing of the right side of the material (not always easy) are important. Guide marks, placed by the cutter in colored chalk, must be consulted. These are often hard to see because of the use of checked or particolored material or because the marks become dim on account of handling.

The location of basting tables away from machines causes loss of time in passing from one station to the other. Additional time is lost because the operator, passing from the relatively well-lighted machine to the darker basting table, must wait for his eye to become dark-adapted before he can see well. This is a process which takes a longer time than the reverse process, i. e., adaption to high from low intensities.

Artificial illumination.—Sixteen per cent of the basting tables had no provisions for local lighting. Hence they depended upon general illuminating provisions. In the remainder, in which such facilities were present, in the case of 23 per cent of the light sources, the facilities were further reduced by reason of missing or burned-out lamps. In general, where artificial lighting facilities were present, local illumination was used, adjustable drop-cord suspension being employed on 98.4 per cent of the tables having artificial lighting facilities.

The average watts per square foot of table surface was 3.15. Under avorable circumstances this is sufficient to produce the necessary llumination, but the improper selection and location of lamps and eflectors greatly reduced the efficiency of utilization.

Reflectors.—No reflectors were employed on 42.4 per cent of the nits. When present 41.2 per cent were of the deep bowl or cone ype and 58.8 per cent of the shallow saucer type.

The usual fault of fitting reflectors with lamps too large was present n many instances.

Glare effects.—No basting tables were so located that workers were ubject to daylight glare effects. On the other hand, glare effects ere present in the case of 94 per cent of the artificial sources emloyed, the reasons for glare production being the same as those reviously described.

BUTTONHOLE MACHINES.

Because their location is so generally disadvantageous, some refernce should be made to buttonhole machines, although they form but relatively small part of the shop equipment. In fact, small shops ten do not go to the expense of purchasing a buttonhole machine, sending such work out to regular buttonhole shops or employing a buttonhole maker furnishing his own machine, as occasion serves.

As buttonhole shops require but little floor space many of these are located in basements. Shop No. 28 (Table 7, Appendix C) is a typical example of such a shop.

Location.—The space reserved for buttonhole machines in workrooms is usually that left after the other equipment has been installed. In one shop, however, the buttonhole machine was included in the bank of sewing machines. Though 73.3 per cent of buttonhole machines were located near a window, in many instances, such windows opened on an air shaft so that the sky angle was practically zero.

Prevailing intensities of illumination on buttonhole machines.—The illumination, at the needle point on 55 per cent of the buttonhole machines was below 5 foot-candles, in 15 per cent of the machines it was below 0.1 foot-candle. The operation which requires close visual attention in buttonhole machines is the correct location of the buttonhole. When this has once been fixed the remainder of the operation is more or less automatically executed by the machine. Shadows, or low illumination cause considerable difficulty in distinguishing the marks showing the location of buttonholes.

Artificial illumination.—The artificial illumination of buttonhole machines was usually provided for by adjustable drop-cord suspension, the operator arranging the unit according to his taste and maintaining it in position by means of tape secured to the machine.

Reflectors.—Fifty-three and eight-tenths per cent of the lamps used at buttonhole machines were bare. When reflectors were used, 80 per cent were of the conical and 20 per cent of the shallow saucer type.

Distribution.—Adjustable drop cord suspension was used at 92.3 per cent of the machines. The location was such that at all the machines, shadows were cast by machine parts upon the work to a greater or less extent.

Glare effects.—Glare effects were present in 81.8 per cent of the machines by reason of the usual causes.

DESIGN DEPARTMENTS.

The design departments of workshops, as their name indicates, are the departments where sample garments are made up. As finish and workmanship of samples are important factors in the sale of finished garments, much care is exercised in their production, garment workers engaged in making samples being the most skilled in the various groups. The bearing of good lighting conditions upon ease and accuracy in work seems to be well recognized by garment manufacturers in that care is taken to provide, in design departments, the greatest measure of illumination possible in the workshop under consideration. In all the shops visited the design department was located in the most desirable portion of the shop from the standpoint of daylight illumination.

As a result illuminating conditions in design departments were on the whole much superior to the conditions prevailing in the rest of the shop. Thus, in no case, (at the season in which this survey was made) was it necessary to make use of artificial illumination at any of the working planes in design departments.

Working planes in design departments.—The working planes in design departments are similar to those in the rest of the shop. They consist usually of a cutting table, 1 to 6 machines, a finishing table, and a pressing board. All these planes are either parallel or perpendicular to windows.

Artificial illumination.—While, because of superior daylight illumination, the need for artificial illumination arises with much less frequency in design departments, facilities are generally provided for such illumination.

The methods employed in design departments for furnishing artificial light are similar to those previously noted in regard to the artificial illumination of workshops and show a similar disregard of basic illuminating principles. From the evident desire of manufacturers to furnish workers in design departments with the best light available the conclusion is justified that the departures from correct principles previously noted spring from lack of knowledge and not from negligence to comply with these principles.

Glare effects.—Glare was present in the case of workers facing windows at none of the machines, at 37.5 per cent of design cutting tables, 83.4 per cent of design finishing tables, and 50 per cent of design pressing tables.

Glare effects from artificial lights would be caused in all cases where naked lamps or lamps too big for the reflector, suspended in the ordinary visual field, were used.

On examining the artificial lighting installations of design rooms or glare, glare effects were present at all the various working planes, rom lamps in operating condition, with the exception of machines where glare was present in 70 per cent of the instances. A countervailing circumstance was the fact that conditions requiring the use of artificial lights are not so frequent in design as in other shop departments. On the other hand, whenever these conditions did arise, glare effects from the artificial light units were present in the arge majority of instances.

This merely emphasizes the observation made over and over again n the course of the survey that, in providing artificial illumination, manufacturers, while often generous in the amount provided, paid ut scant attention to proper distribution and protection of the workers' eyes from glare effects.

Prevailing intensities of illumination in design departments.—The average intensities of illumination in design departments fell below foot-candles on the various working planes in the following percentage of cases: Machines, 6.2 per cent; cutting tables, 37.5 per cent; finishing tables, 16.1 per cent; pressing boards, 37.5 per cent. With the exception of cutting tables, the average intensities of illumination in design departments were decidedly superior to those prevailing in the rest of the shop.

ILLUMINATION OF STAIRWAYS.

The proper illumination of stairways is necessary in order to prevent accidents, facilitate egress in the case of emergencies, and to prevent accumulations of dirt. Necessity for the provision of adequate illumination of stairways is recognized in section 81, paragraph 3, of the Laws Relating to Labor, Factories and Mercantile Establishments, Department of Labor, New York State, which says in part:

> The halls and stairs leading to the workrooms shall be properly and adequately lighted, and a proper and adequate light shall be kept burning by the owner or lessee in the public hallways near the stairs, upon the entrance floor and upon other floors on every workday in the year, from the time when the building is open for use in the morning until time it is closed in the evening, except at times when the influx of natural light shall make artificial light unnecessary.

Windows.—Table 12, Appendix C, shows the illumination conditions met with in the halls and stairs of shops examined. Of the stairs examined, 32.4 per cent had windows opening at the floor landings.

Color of walls, ceiling, and stairs.—The walls of the stairs and landings were black, dark brown, or dark buff in 67.5 per cent of the stairs and 32.5 per cent were white. The ceilings over the stairs and landings were black, dark brown, or dark buff in 51.4 per cent of the stairs and 48.6 per cent were white. The stairs and railings were of a dark color in 97.3 per cent of those examined, 2.7 per cent being finished with aluminum paint.

The albedo of dark colored walls, ceiling, and stairs is low, being about 5 to 10 per cent. Consequently 90 to 95 per cent of the light falling on such walls is absorbed. It is therefore desirable that the stairs and railing be finished so that their albedo shall be high (70 to 85 per cent).

Artificial lights.—Of the stairs examined 89.2 per cent had lights of some kind at the floor landings and 10.8 per cent had no lights. Of the 89.2 per cent of the stairs which had lights 25.6 per cent of the units would not light. Of the units used 23.3 per cent were of the flat-flame gas type without shade or reflector, 63.3 per cent were gem electric units, and 13.4 per cent were tungsten electric units.

Reflectors.—Of the total number of units used 10.8 per cent were equipped with shades of the semi-ornamental type, and 89.2 per cent f the units were unshaded lamps. The shades used were useless as eflectors and only served to shade the lamp from the eyes of those sing the stairs. The usual error of employing lamps too large or shades was also in evidence.

Location of units.—The common practice is to locate units at floor andings or at turns in stairs or at both. The units were suspended y fixed wall brackets at an average height of 6 feet from the floor.

TABLE 13.—*Prevailing intensities of illumination on stairs (by stairs).*

Foot-candles.	Average.				Maximum.				Minimum.			
	Combined daylight and daylight and artificial light.	Per cent.	Daylight and artificial light.	Per cent.	Combined daylight and daylight and artificial light.	Per cent.	Daylight and artificial light.	Per cent.	Combined daylight and daylight and artificial light.	Per cent.	Daylight and artificial light.	Per cent.
01–0.0099	5	13.5	3	16.7	2	28.6	0	0	2	28.6	0	0
–0.049	14	37.8	7	38.8	1	14.3	1	33.3	1	14.3	1	33.3
–0.099	8	21.7	5	27.85	0	0	0	0	1	14.3	1	33.3
–0.99	2	5.4	2	11.1	1	14.3	1	33.4	0	0	0	0
.99	0	0	0	0	0	0	0	0	0	0	0	0
.99	1	2.7	0	0	1	14.3	1	33.3	2	28.6	1	33.4
.99	1	2.7	0	0	1	14.3	0	0	0	0	0	0
19.99	3	8.1	1	5.55	0	0	0	0	0	0	0	0
49.99	2	5.4	0	0	0	0	0	0	1	14.2	0	0
nd over	1	2.7	0	0	1	14.2	0	0	0	0	0	0
Total	37	100.0	18	100.0	7	100.0	3	100.0	7	100.0	3	100.0
al on which illumination as less than 0.1 foot-candle.	27	73.0	......	......	3	42.8	......	......	4	59.2	......	......
irs with artificial light elow 0.1 foot-candle	......	......	15	83.35	......	......	1	33.3	......	......	2	66.6

Illumination.—Table 13 shows the distribution of the illumination countered on the stairs, by stairs. Of those stairs on which the ylight was relied upon for illumination 73 per cent had actual erage values of illumination of below 0.1 foot-candle, and in 51.3 cent of the instances below 0.05 foot-candle. Of those stairs on ich artificial illumination was used 83.4 per cent had an actual erage illumination of less than 0.1 foot-candle, and less than 0.05 t-candles in 55.5 per cent.

SUMMARY.

lluminating conditions were investigated in a group of 34 workps containing 45 workrooms, typical of the women's garment intry in New York City. The average illumination was measured the following working planes: 69 cutting tables, 47 pressing tables unting 228 pressing boards, 95 banks of sewing machines coning 851 machines, 20 buttonhole machines. 131 finishing tables with places for 610 finishers, and 42 basting tables. The results o the investigation may be summarized as follows:

Extent of artificial illumination.—All the shops visited utilized day light illumination. At 23 per cent of the shops auxiliary artificia illumination at some working plane had to be depended upon habit ually. The measurements were made during the summer; therefor the average illumination found represented maximum seasonal illu mination values. During the winter the average illumination at man of the planes would be lower and, owing to short winter days an the necessity for overtime at night, the artificial illumination c working planes would be more frequent.

Floor area-window area ratio.—The average ratio of floor area t window area was found to be 10.6 :1. The effective floor area window area ratio was still higher than this, being 12.6 to 1 becaus of the use, in many shops, of partitions cutting off window space The efficiency of windows was often still further reduced (*a*) b reason of small sky angles, hence high angle of incidence of ligh (*b*) failure to use prismatic or factory-ribbed glass with window having the above-mentioned characteristics; (*c*) dirty windows; (*c* obstructions in windows encroaching on their area, such as piles garments, or wooden latticework used for burglar protection system

Illumination found at working planes.—Illumination measure under actual working conditions in the shops surveyed was as follow

TABLE 14.—*Illumination found at working places.*

Working plane.	Illumination adequate.	Illumina tion inad quate.
	Per cent.	*Per cen*
Cutting tables	37.7	6.
Machines	55.5	44
Basting tables	16.6	8
Finishing tables	49.7	5
Pressing boards	42.3	5
Buttonhole machines	45.0	5
DESIGNING DEPARTMENTS.		
Design cutting tables	62.5	3
Design machines	93.8	
Design finishing tables	83.3	1
Design pressing boards	62.5	3
Stairs	27.0	7
General average	47.4	5

These computations are based upon the requirement that all wor ing planes (with the exception of stairways in regard to which illumination of 0.1 foot-candle was deemed adequate) should ha a minimum average illumination of 5 foot-candles to insure fav able conditions in an industry making such demands upon the e as the women's garment industry.

In practice, in shops with good illumination, this minimum was often exceeded, average daylight illumination of ten times the minimum being observed on working planes in a number of instances.

It is seen that a little over one-half of all the working planes measured fell below the minimum requirements for adequate illumination. On the other hand the illumination in design departments of garment workshops where sample garments are made was much better than the illuminating conditions prevailing in the rest of the shop. The above table shows that the illuminating facilities provided for making sample garments are generally good, with the exception of some glare effects from facing windows. Workers on this type of garment were placed by shop owners under the best illuminating conditions afforded by the workshop in question.

Location of working planes.—Forty-five per cent of all working planes were perpendicular to windows, 17 per cent were parallel to windows, and 38 per cent were centrally located.

The illumination on working planes perpendicular to windows falls off rapidly as distance from the windows increases. On working planes parallel to windows workers facing the windows are subject to glare. On centrally located working planes the daylight illumination is apt to be inadequate.

On the whole the illumination was found to be most satisfactory ipon working planes perpendicular to windows, provided such planes vere not too long.

Lack of uniformity in distribution.—Lack of uniformity in distribuion of illumination was a frequent defect noted. Variations of 50 or 0 times in the intensity of the illumination on long working planes vas not infrequently encountered.

Artificial illumination.—The location of working planes from the tandpoint of artificial illumination was immaterial. The general nethod found employed was that of local illumination. The most ommon arrangement of units was that of adjustable drop-cord susension over the center line of working planes. Fifty-four per cent f the total number of artificial units were arranged in this manner.

Reflectors.—The reflectors in use could be grouped in two general lasses, bowl or cone, and shallow saucer reflectors. Sixty-nine per ent of all reflectors were bowl or cone, and 31 per cent were of the hallow saucer type.

Thirty-eight and two-tenths per cent of all the artificial sources were are without shade or reflector.

The primary artificial light sources most commonly used were as ollows: 100-watt tungsten (clear), 31 per cent; 60-watt tungsten lear, large bulb), 22.6 per cent; flat-flame gas (6 cubic feet per our), 19.2 per cent; 50-watt "Gem" (clear), 14.4 per cent.

Distribution.—The distribution of artificial illumination on working planes was decidedly poor as shown by the high value of ratios of maximum to minimum illumination in the specific tables of illumination values (Appendix C). It was common practice to have the lighting units so arranged that the workers could vary their position at will. There was a large range of variations found between the theoretical and the actual position of units relative to working planes.

Troublesome moving shadows were common, due to drop-cord lamp suspension. Such units placed in workrooms located on upper floors of loft buildings tend to swing because of swaying movements of the building.

Glare effects.—Glare effects from daylight sources were present at all working planes (17 per cent) parallel to windows. Of the total number of artificial light sources in working condition 82 per cent produced glare effects. The causes for this high percentage of glare effects were as follows:

1. Use of bare lamps.
2. Use of reflectors designed for smaller lamps.
3. Improper reflectors.
4. Low mean angle of glare.

Common defects noted.—The following is a list of prevailing defects noted which produced inadequate illumination or glare effects:

1. Poor arrangement of working planes relative to windows.
2. Reduction of effective window area (average reduction, 18 per cent) by the use of opaque partitions.
3. Use of plain glass windows with high angles of incidence.
4. Dirty window glass (very dirty, 7.6 per cent; dirty, 54 per cent; fairly clean, 22.6 per cent; clean, 15.1 per cent).
5. Obstruction of windows by piles of garments or latticework burglar alarms.
6. Use of clear, unshaded lamps (38.2 per cent).
7. Use of saucer and disk types of reflectors for local illumination (31 per cent).
8. Use of lighting units and reflectors unsuited to each other (e. g., lamps too large for reflectors).
9. Dirty reflectors and lamps.
10. Too high or too low suspension of units.
11. Lamps suspended with adjustable drop cords for local illumination (71.3 per cent).
12. Lamps missing, burned out, blackened, short circuited.
13. Use of a few large instead of a greater number of smaller units for local illumination.
14. Lack of uniformity in the distribution of illumination upon working planes.

CONCLUSIONS.

1. Adequate provisions for illumination are particularly necessary in the women's garment industries, (*a*) because of the exacting visual demands of the occupation; (*b*) because of the presence of a large number of visual defects in workers in this industry (vide Part I).

2. Photometric measurements made during the summer of 1914 in a group of 34 typical workshops show that the illumination was inadequate in the case of a little over one-half the working planes measured.

3. Departures from correct principles in illumination were common in shops. The effects of such departures are to produce: (*a*) Inadequate illumination; (*b*) glare effects; (*c*) lack of uniformity in distribution of illumination; (*d*) troublesome shadows.

RECOMMENDATIONS.

The recommendations which may be made are of two classes, (1) those to improve the daylight illumination of workshops and (2) those to improve the artificial illumination.

IMPROVEMENT OF DAYLIGHT ILLUMINATION.

Selection of shop.—In selecting a loft for a garment factory in New York City, the following points should be considered:

1. The building should be on a numbered street (streets having a general east and west direction).

2. Preference should be given to upper floors, as the sky angle increases as the height from the street. The floor at which optimum conditions obtain is, of course, dependent upon the neighboring sky line.

3. Opposite buildings should be light in color. This is especially important when the workroom must be situated upon a lower floor.

4. The ratio of floor area to window area should not be greater than 10:1. Less than this is desirable.

5. With large sky angles plain window glass may be used. With small angles, the use of prism or factory ribbed glass is recommended. Care should be taken to install such glass according to manufacturers' direction.

6. The ceiling height should be the greatest available. Windows should reach to within a few inches of the ceiling. For equal window areas, tall windows give the best illumination.

7. Walls and ceiling should be finished with a white, mat surface.

8. Trim and doors should be light in color.

9. Stairs should, so far as practicable, have a window at each landing, or in default of this have adequate artificial illumination so

shaded that glare from lamps will not obscure vision. Walls and ceilings of stairs should be finished with white mat surface. Hand rails and risers of stairs should be painted with aluminum paint.

Arrangement of working planes.—Owing to the fact that working planes in garment workshops may be arranged peripherally, leaving the center of the shop for other purposes, attention to the location and disposition of such planes may effect considerable improvement in existing conditions even if the floor area, window-area ratio, is large. With respect to the necessity for providing optimum illuminating conditions, working planes should be weighted in the following order:

1. Machines. } Equal weight.
   Finishing tables. }
2. Cutting tables.
3. Basting tables.
4. Pressing tables.

Arrangement of machines.—Daylight from overhead would be the ideal method for illuminating machines and finishing tables. Opportunity for such lighting methods, however, will be seldom, if ever, encountered in New York. We have, therefore, to choose between the arrangement of machines perpendicular or parallel to windows. Both methods have their disadvantages, especially so long as operators sit on opposite sides of machine tables. The disadvantages of the perpendicular arrangement consist in the rapid fall of illumination as the distance from the window increases, and the fact that if the direction of the light is an optimum for one operator it is not so likely to be so for the worker on the opposite side. The parallel arrangement of machines is defective because of the fall of the illumination gradient on machines opposite wall space, the fact that, operators, with backs to the windows, are in their own light and because operators facing windows are subject to glare effects. On the whole the arrangement of machines perpendicular to windows is to be preferred. The number of machines in a bank should be limited to 6 or 8. This arrangement has the further advantage that for equal areas the number of machines can be slightly increased.

Finishing tables.—The lighting facilities afforded should, for finishing tables, be on a par with those for machines. Finishing tables should be placed in proximity and perpendicular to windows. The practice of placing long lines of tables end to end should be avoided because, generally speaking, such arrangement tends to great variations in uniformity of illumination.

Cutting tables.—Cutting tables should not exceed in dimensions the minimum space requirements of two cutters working on opposite sides. The use of the unnecessarily long tables frequently observed renders uniformity in their illumination, by daylight almost impossible with existing conditions. Cutting tables should be placed perpendicular to and in proximity to windows whenever practicable.

Pressing tables.—When practicable, pressing tables, also, should be placed in proximity and perpendicular to windows. If window space be not available they should be placed parallel to and in line with finishing tables at the minimum distance consistent with existing aisle regulations.

Basting tables.—Basting tables should, in general, be placed close to and parallel with machine banks.

Design departments.—But little can be said about improving the illumination of design departments as these usually have the best illumination available in shops. Glare effects from facing windows should be avoided. The working planes should conform in arrangement to the respective locations already described.

Show rooms and offices.—While it is desirable that showrooms and offices should occupy positions commanding a view of the street, convenient to the loft entrance, care should be taken in the location and construction of partitions that these do not cut off any more of the available window area than is commensurate with the importance of these departments.

Central portion of shop.—The central portion of the shop should be used for stock only. With small sky angles it is advisable to fit the upper sashes of windows with prismatic glass, care being taken to have the corrugations horizontal and on the exterior surface of the window. A considerable proportion of the incident light will thus be centrally directed.

Partitions.—Partitions should not be used except when absolutely necessary. When needed they should be constructed of translucent material with a high coefficient of transmission.

ARTIFICIAL LIGHTING.

General illumination.—The entire shop should have a system of general artificial lighting adequate to insure an illumination of not less than 1 foot-candle over the entire floor area.

Machines and finishing tables.—Machines and finishing tables should have such additional local illumination as to insure a minimum lighting on working planes of 5 foot-candles with light and 7 for dark material.

Cutting, basting, and pressing tables.—The general illumination should be increased in the vicinity of cutting, basting, and pressing tables to insure a minimum of 5 and 7 foot-candles, respectively, for light and dark materials.

Design rooms.—The general and local illumination of design rooms should conform to the above-mentioned standards.

Offices and showrooms.—In offices and showrooms it is usually desired to have the lighting present a more or less artistic effect. The method of lighting should be that of general illumination, either direct, semi-indirect, or indirect. A minimum illumination should be secured of not less than 4 foot-candles on working planes in offices and on the floors of showrooms.

Character of lighting units—General illumination.—Satisfactory units for the general illumination of shops would consist of tungsten or gas-mantle lamps provided with deep-bowl reflectors having extensive distributing characteristics. The units should be suspended as nearly as possible to the ceiling in such relative positions as to insure a minimum distribution of 1 effective lumen over each square foot of floor area.

Machines and finishing tables.—The additional local illumination of machines and finishing tables may be advantageously secured by the use of tungsten or gas-mantle lamps and opaque reflectors with intensive distributing characteristics of the deep-bowl or cone type. Fixed suspension should be used. The height of suspension will depend upon the distribution characteristics of the reflector used. For machines the spacing should be 1 unit for each machine. For finishing tables the height of suspension and the number of units should be such as to provide a minimum of 5 and 7 effective lumens per square foot, respectively, for light and dark materials.

It should be remembered, in this connection, that in finishing operations the working plane extends from the table outward upon the lap of the worker, or approximately 1.5 feet beyond the edge of table, the average width of the standard finishing table being 12 inches.

Local illumination of cutting, basting, and pressing tables.—The local lighting units for cutting, basting, and pressing tables may be made up of tungsten or gas-mantle lamps with deep-bowl prismatic reflectors of glass with intensive distributing characteristics. The height of suspension and spacing should be such as to produce a distribution of 5 and 7 effective lumens for light and dark materials, respectively, per square foot of table area.

Glare effects.—It is important to avoid all glare effects, for not only do these make seeing difficult but they are injurious to the eyes.

Glare is present from any light source, under ordinary working conditions, when it is in the field of vision and is of greater intrinsic brilliance than the object to be viewed. It follows that in the local illumination of workshops bare lamps or reflectors of the shallow-saucer type should never be used. Prismatic reflectors should be of the deep-bowl type and suspended at such heights as to cause the units to become practically concealed sources. Opaque deep-bowl or cone reflectors are always to be used for local illumination when the height of suspension is such that the unit will be within the ordinary field of vision.

All reflectors are made for use with a particular size of lamp. This specific size should always be used with the reflector. The use of larger lamps produces glare from the projecting portions and alters the distribution characteristics of the combination; the use of lamps smaller than that for which the reflector is designed constitutes an uneconomical unit, which may produce inadequate illumination and alter the distribution characteristics of the reflector.

APPENDIXES.

APPENDIX A.

METHOD OF DETERMINING THE SKY ANGLE AND ANGLE OF GLARE.

In view of the part played by the sky-angle value in producing good natural illumination, as well as the action of glare effects in reducing visual acuity, producing discomfort in seeing and ocular fatigue, cuts showing the respective methods for determining sky angles and angles of glare are herewith appended.

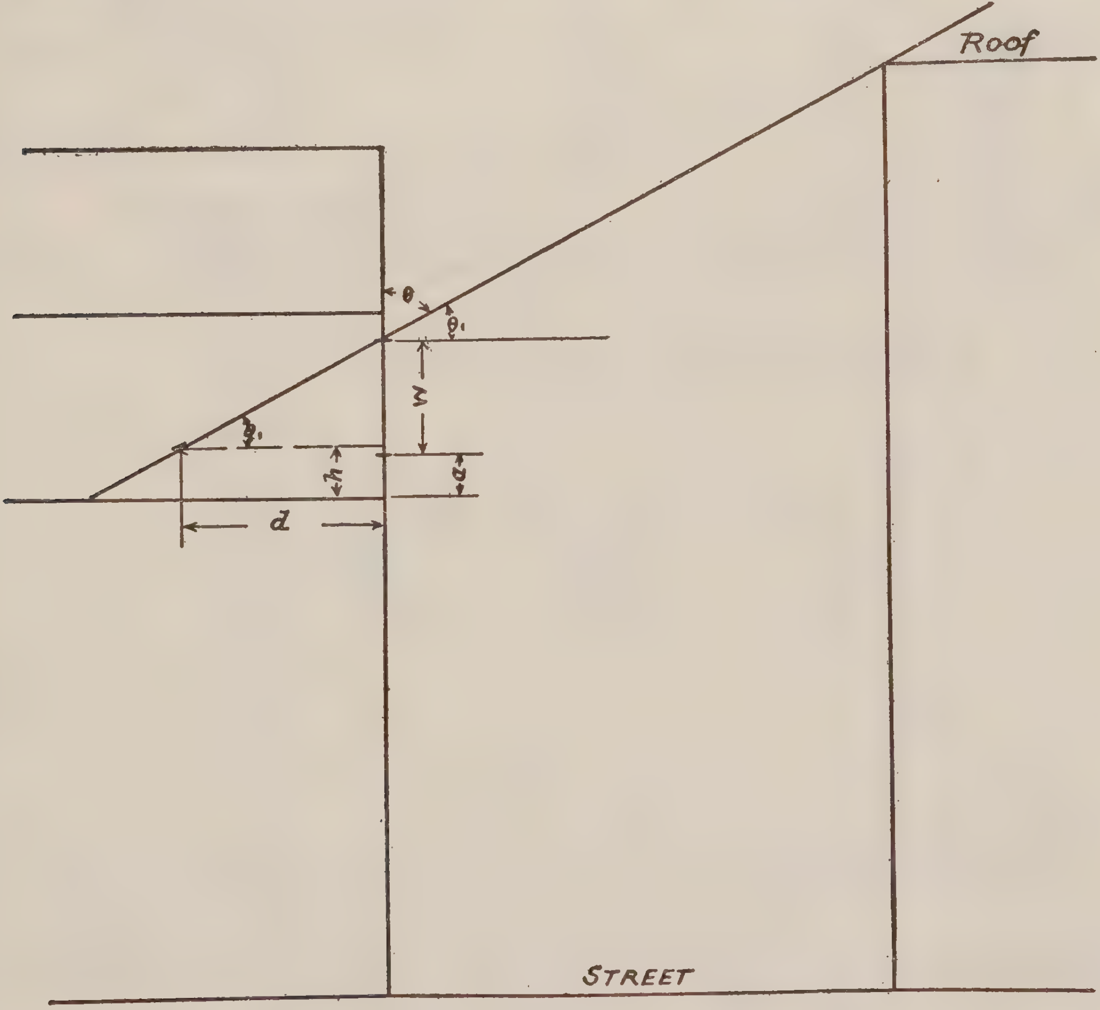


FIG. 1.—Method of determining sky angle of a room.

Sky angle.—The sky angle is determined as follows:

Let h = height of eye of observer from floor.
Let d = distance of observer from window.
Let a = height of lower part of window from floor.
Let w = height of window.

When the observer is in such a position that a line from the eye intersects the top of the window and the top of the roof of the opposite buildings,

$$\theta = \text{sky angle.}$$

$$\theta_1 = \tan^{-1} \frac{w-(h-a)}{d}$$

$$\theta = 90° - \theta_1.$$

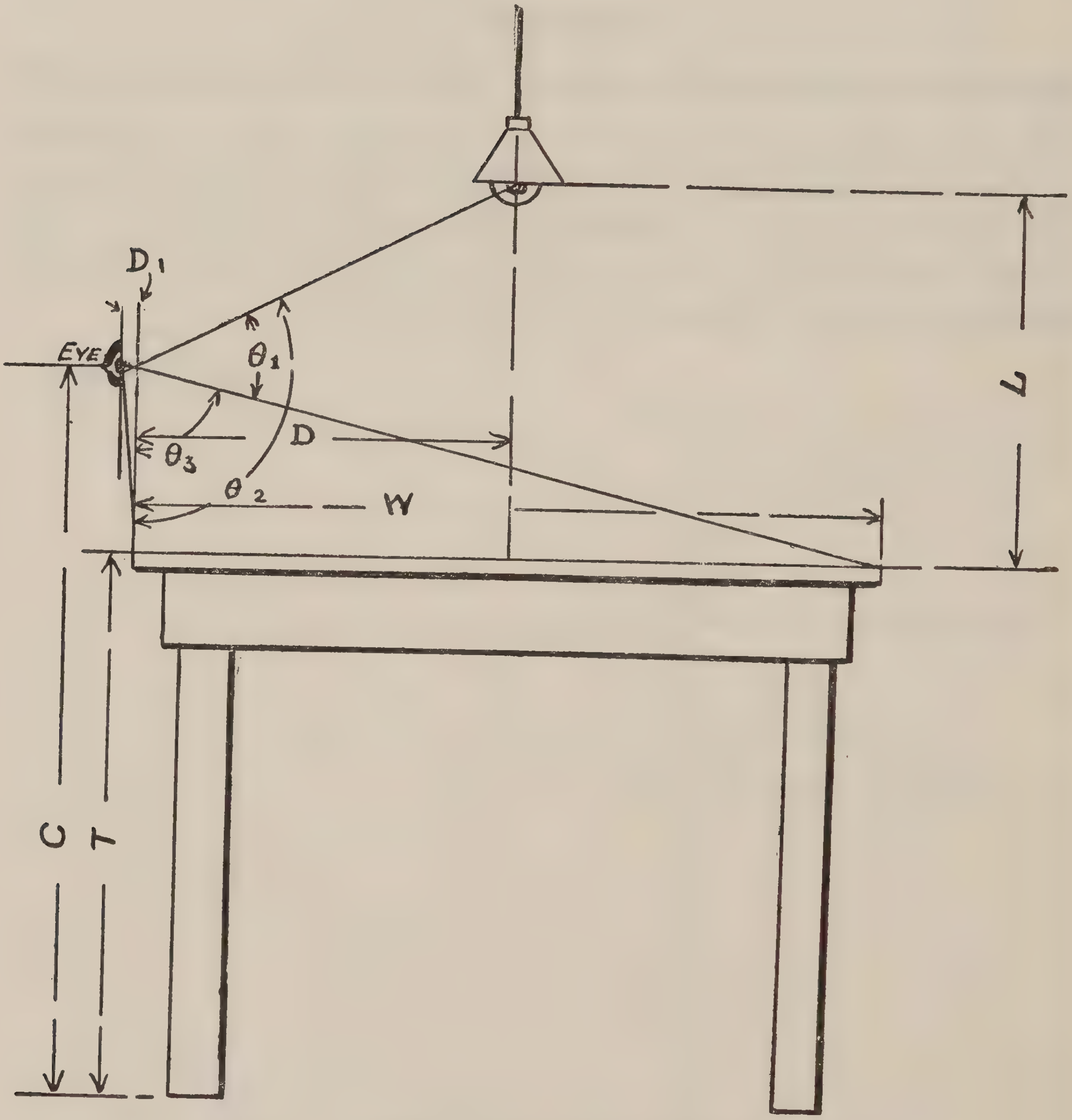


FIG. 2.—Method of determining angle of glare for cutting and basting tables.

Angle of glare.—The angle of glare is determined as follows for cutting and basting tables:

Let c = height of the eye of the cutter from the floor.
Let T = height of the table top from the floor.
Let W = width of the table.
Let L = height of lamp above table.
Let D = horizontal distance of lamp from edge of table.
Let D_1 = horizontal distance of edge of table from eye.
θ_1 = minimum angle of glare.

θ_2 = maximum angle of glare.

$$\theta_2 = 180^\circ - \tan^{-1} \frac{D + D_1}{L - (c - T)}$$

$$\theta_3 = \tan^{-1} \frac{W + D_1}{c - T}$$

$$\theta_1 = \theta_2 - \theta_3$$

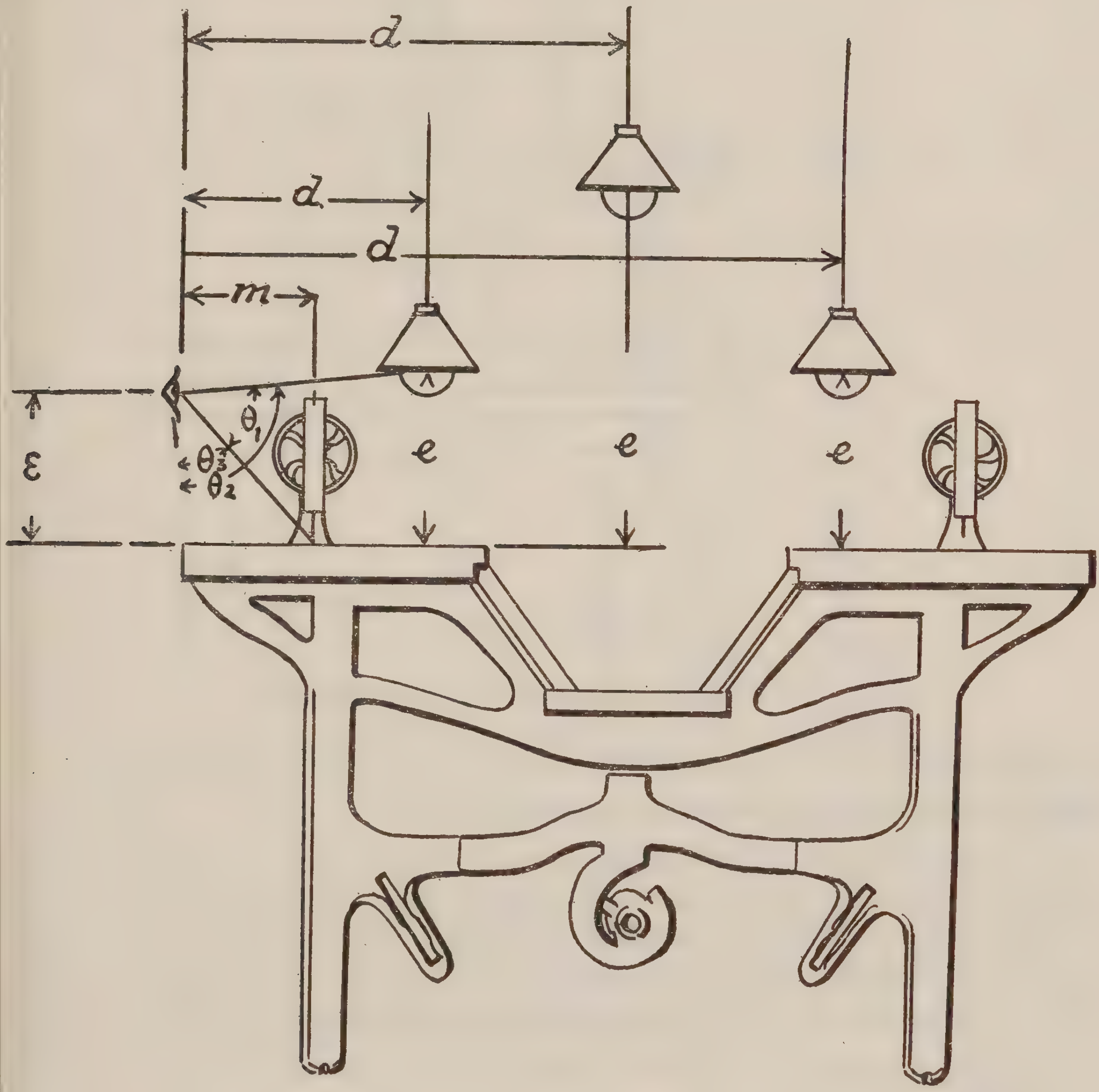


FIG. 3.—Method of determining angle of glare at sewing machines.

The angle of glare at sewing machines is determined as follows:

Let l = height of lamp filament from table top.
Let d = horizontal distance of lamp filament from eye.
Let e = height of eye from top of table.
Let m = horizontal distance of eye to needle point.
θ_1 = the angle of glare.

$$\theta_2 = 180^\circ - \tan^{-1} \frac{d}{l - e}$$

$$\theta_3 = \tan^{-1} \frac{m}{e}$$

$$\theta_1 = \theta_2 - \theta_3$$

In installations of double rows of machines with double rows of lamps the minimum angle of glare will at times be caused by the lamp of the opposite machine.

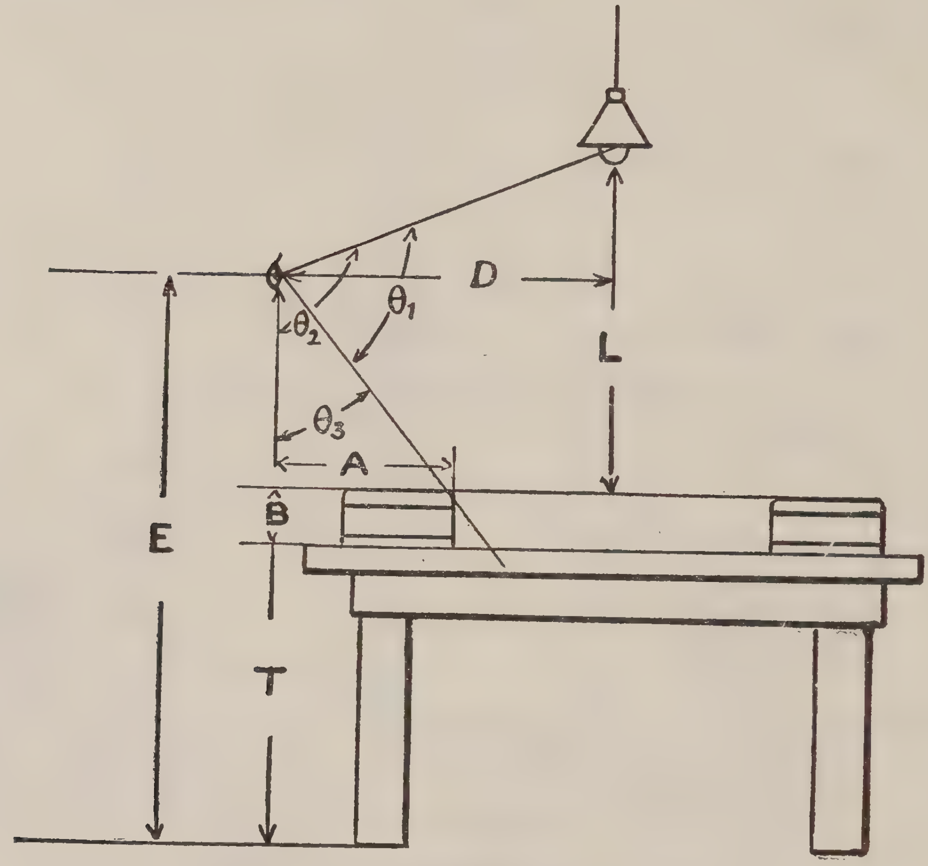


FIG. 4.—Method of determining angle of glare at pressing tables.

The angle of glare at pressing tables is determined as follows:

Let L = height of lamp from top of boards.
Let E = height of eye from floor.
Let T = height of top of table from floor.
Let B = height of top of boards from table top.
Let D = horizontal distance of lamp from eye.
Let A = horizontal distance of eye from inside edge of board.

θ_1 = angle of glare.

$$\theta_2 = 180° - \tan^{-1} \frac{D}{L - [E - (T + B)]}$$

$$\theta_3 = \tan^{-1} \frac{A}{E - (T + B)}$$

$$\theta_1 = \theta_2 - \theta_3$$

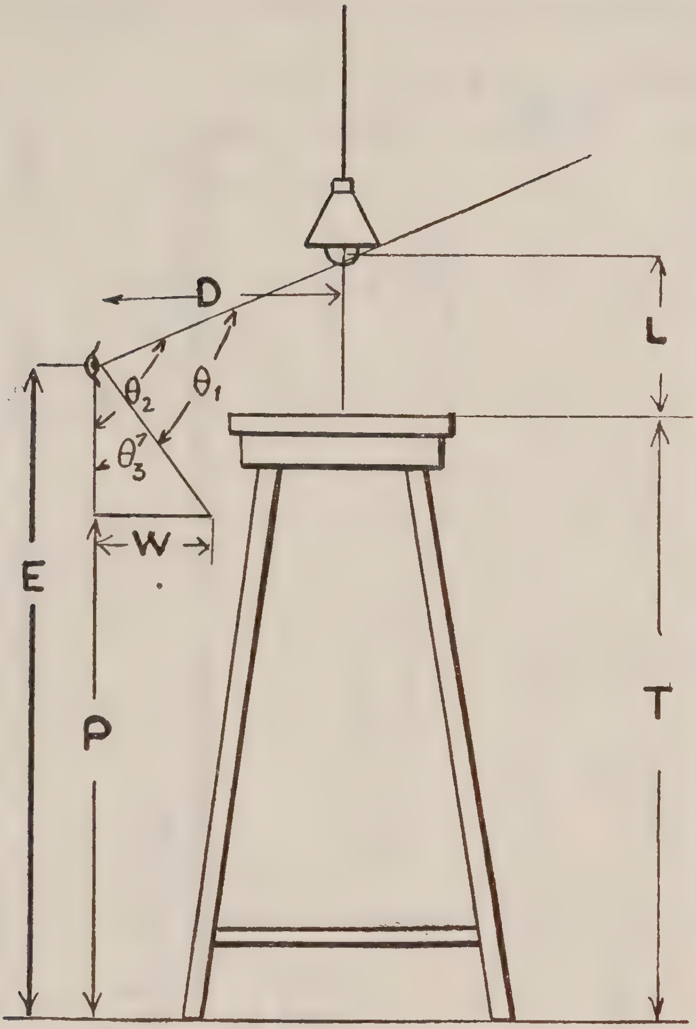


FIG. 5.—Method of determining angle of glare at finishing tables.

The angle of glare at the finishing tables is determined as follows:

Let L = height of lamp from top of table.
Let E = height of eye from floor.
Let T = height of top of table from floor.
Let D = horizontal distance of lamp from eye.
Let W = horizontal distance of work from eye.
Let P = vertical distance from floor to place of work.

θ_1 = angle of glare.

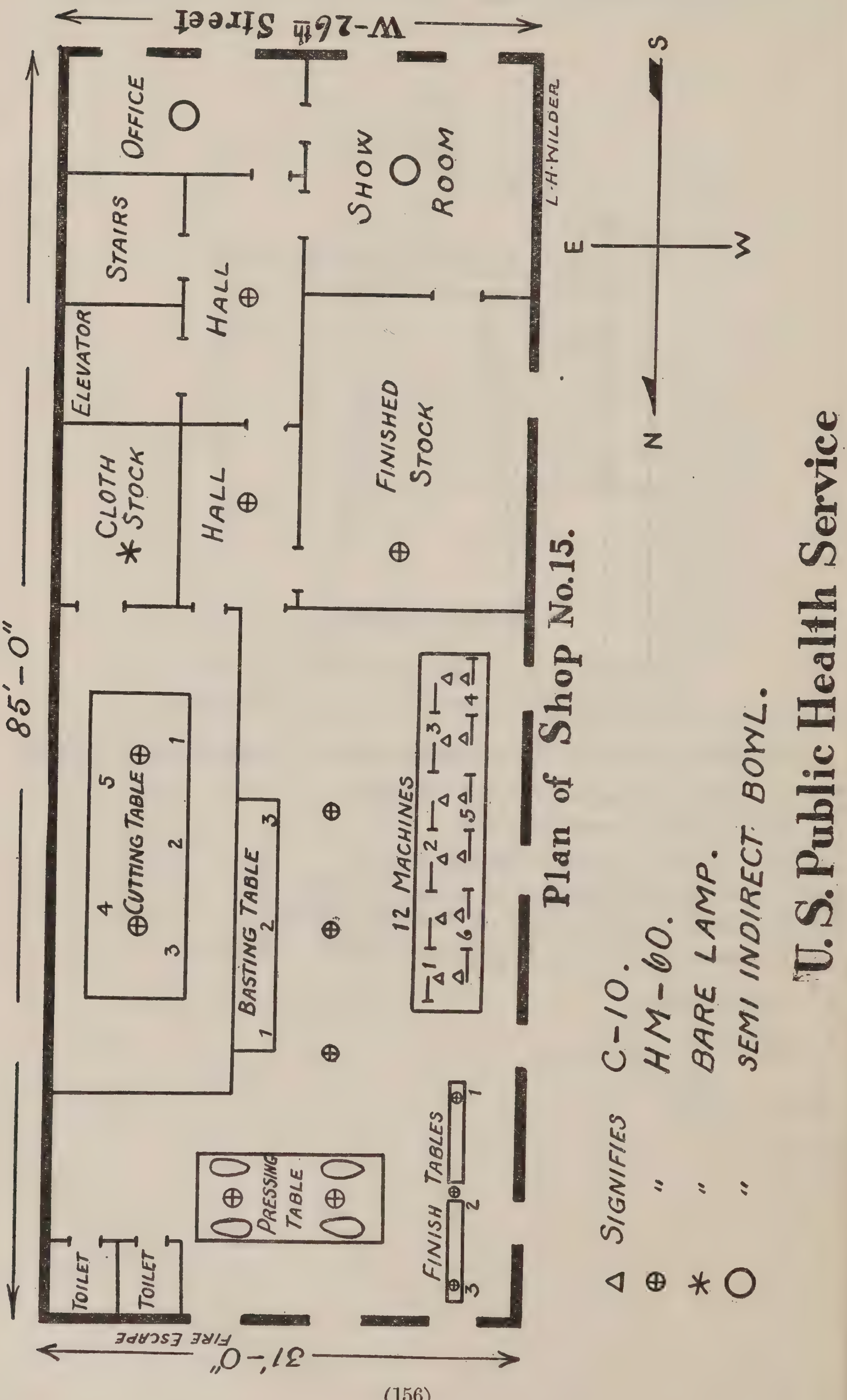
$$\theta_2 = 180^\circ - \tan^{1} \frac{D}{L-E}$$

$$\theta_3 = \tan^{1} \frac{W}{E-P}$$

$$\theta_1 = \theta_2 - \theta_3$$

APPENDIX B.

A SAMPLE PHOTOMETRIC SURVEY (WORKSHOP NO. 15).



Plan of Shop No.15.

U.S. Public Health Service

Industry.—Cloaks and suits.

Weather.—Clear.

Date.—July 20, 1914.

Name of shop.—-----------.

Location.—West Twenty-sixth Street.

Window area.—

N. No. 3. 2 panes each, each pane 3′ 3″ B. x 3′ 9″ H., ⅛″ window glass, clean.

S. No. 4. 2 panes each, each pane 3′ 4″ B. x 3′ 4″ H., window glass, clean.

E. 0.

W. No. 5. 2 panes each, each pane 3′ 1″ B. x 2′ 8″ H., frosted wire glass, dirty.

Opposite buildings.—

N. White.
S. Light gray.
E.
W. Red.

Sky angle.—

N. $a=3''$ $d=2'\ 9''$.
S. No sky.
E. No sky.
W. No sky.

Height of ceiling.—10.25 feet.

Walls.—White alabastine.

Ceiling.—White alabastine.

Floor.—Fifth.

Number of employees.—

Operators	12
Finishers	12
Cutters	2
Pressers	4
Total	30

Working plane data.—

Plane.	Length.	Width.	Height.	Lamps O. K.	Lamps n. g.	Ref.	Height.
Cutting	20′ 6″	7′	34″	2 100 wt.	0	HM60	2′ 6″.
Pressing	12′ 10″.	5′ 10″.	35″ 26″	2 100 wt.	0	HM60	27″.
Machines	6 x 4′	4′	30″	12 50 wg.	0	C 10	Max., 3.33′; min., 0.42′; avg., 2′.
Basting	17′ 8″	31″	30½″	3 100 wt.	0	HM60	7′ (4′ from edge of table).
Finishing	7′	1′	31″	3 100 wt.	0	HM60	4′ 6″.

Illumination.—Outside illumination, clear, but sun not on plate. Attached test plate. Dark and yellow glass on test side of photometer. Secondary standard voltage 1.60 volts (3 p. m.).

dygt.	
2.00	
1.94	
1.94	
5.88	
1.96	Average.

Machines.—Second column lights on. Detached test plate.

Sta.	1.		2.		3.		4.		5.		6.	
	ygt.	lygt.	ygt.	ygt.	ygt.	lygt.	lygt.	lygt.	ygt.	ygt.	ygt.	lygt.
	2.71	6.60	2.75	10.50	1.13	2.28	0.955	2.21	1.75	17.0	8.60	2.32
	2.69	6.40	2.88	9.52	.99	3.45	.955	2.19	1.78	16.0	7.62	2.31
	5.40	13.00	5.63	20.02	2.12	5.73	1.910	4.40	3.53	33.0	16.22	4.63
Avg.	2.70	6.50	2.82	10.01	1.06	2.86	.955	2.20	1.76	16.5	8.11	2.32

Outside illumination.—Clear but sun not on plate. Attached test plate. Dark and yellow glass on test side of photometer secondary standard voltage = 1.60 volts (3.20 p. m.).

4.32	
4.00	
4.00	
12.32	
4.11	Average.

Pressing table illumination.—No lights on detached test plate.

Sta.	1	2	3
	ygt.	ygt.	ygt.
	10.2	9.18	14.2
	10.3	9.40	14.0
	20.5	18.58	28.2
Av.	10.25	9.29	14.1

Finishing table illumination.—Detached test plate. No lights on.

Sta.	1	2	3
	ygt.	ygt.	ygt.
	5.32	1.50	2.80
	5.20	1.51	2.80
	10.52	3.01	5.60
Av.	5.26	1.50	2.80

Basting table illumination.—Second column lights on. Detached plate.

Sta.	1		2		3	
	ygt.	ygt.	ygt.	* ygt.	ygt.	* ygt.
	1.10	1.39	0.878	1.18	0.868	1.28
	1.05	1.37	.910	1.22	.852	1.35
	2.15	2.76	1.788	2.40	1.720	2.63
Avg.	1.08	1.38	.894	1.20	.860	1.32

Cutting table illumination.—Second column lights on. Detached plate.

Sta.	1	2	3	4		5	
	lgc. ygt.	lgc. ygt.	lgc. ygt.	lgc. ygt.	lygt.	lgc. ygt.	lygt.
	2.95	3.92	4.10	3.92	0.688	3.70	0.760
	2.89	4.08	4.28	3.75	.668	4.20	.740
	5.84	8.00	8.38	7.67	1.356	7.92	1.500
Avg.	2.92	4.00	4.19	3.83	.678	3.96	.750

Albedo of walls.—Walls good.

E ygt.	Attached plate.	b ygt.
3.29		3.28
3.36		3.42
3.45		3.22
10.10		9.93
3.37		3.31

Illumination on stairs.—Drop ceiling, white, walls maroon, steps maroon. One 50-watt Gem o. k. in wire cage at door 8 feet up. Attached plate.

lgc. ygt.
2.21
2.18
4.39
2.20

Remarks.—The basting table is next to the paling fence which orms the partition of the cutting room. Where the lights of the utting room are on, the surface of the basting table has alternate ight and dark bands thrown upon it. The basting table readings narked * were taken in the light places while the others were in the ark places.

The cutter does not use the lights over the cutting table, althoug it is very dark there. I understand that the owner of the shop i penurious and objects to employees using electric light in the day time

Twenty-four samples of cloth were taken from this shop for albed measurements. Each observation is the mental average of tw photometer settings.

COMPUTATION OF RESULTS OF SURVEY.

Window area—

N. $3\text{x}2\text{x}3.25\ \text{x}3.75'=73.2$ sq. ft.
S. $4\text{x}2\text{x}3.33'\text{x}3.33'=88.8$ sq. ft.
E. O
W. $5\text{x}2\text{x}3.08'\text{x}2.67'=82.3$ sq. ft.

Total, 244.3 sq. ft.

Floor area.—$=85'\text{x}31'=2{,}636$ sq. ft.

Ratio floor area—window area—$=10.8$

Sky angle N.—

$$\theta 1=\tan -1\ \frac{7.5-(5.25-3)}{2.75}=\tan -1\ 1.91$$

$$\theta 1=62.4^\circ.$$

$$\theta\ =90^\circ-\theta=27.6^\circ.$$

Machines—Angle of glare.—

$$\theta_2=180^\circ-\tan^{-1}\frac{1}{2-1}=180^\circ-\tan^{-1}1.$$

$$\theta_2=180^\circ-45^\circ=135$$

$$\theta_3=\tan^{-1}\frac{7}{12}=\tan^{-1}.583$$

$$\theta_3=30.2^\circ$$

$$\theta_1=\theta_2-0_3=105^\circ \text{ Average.}$$

$$\theta_2=180^\circ-\tan^{-1}\frac{1}{.42-1}=180^\circ-\tan^{-1}-1.72$$

$$\theta_2=60^\circ$$

$$\theta_3=30.2^\circ$$

$$\theta_1=60^\circ-30^\circ=30^\circ \text{ minimum.}$$

Illumination data—Machines.—

dygt = multiplying factor of 165 with attached plate.
ygt = multiplying factor of 0.486 with detached plate.
lygt = multiplying factor of 6.17 with detached plate.

Illumination daylight.	Illumination daylight and artificial light.
Foot-candles.	*Foot-candles.*
1.31	40.1
1.37	4.9
0.52	17.6
5.89	
.85	13.6
3.42	8.0
	14.3
13.36	98.5
Average 2.22	Average 16.5
Max. 5.89	Max. 40.1
Min. 0.52	Min. 4.9

Pressing tables—Angle of glare.—

$$\theta_2 = 180^\circ - \tan^{-1}\frac{2.91}{2.25-(5.25-2)} = 180^\circ - \tan^{-1} - 48.9$$

$$\theta_2 = 89^\circ$$

$$\theta_3 = \tan^{-1}\frac{1}{5.25-2.92} = \tan^{-1}.429 = 23.2^\circ.$$

$$\theta = 89^\circ - 23.2^\circ = 66^\circ.$$

Illumination in foot-candles.—

4.97
4.51
6.85

16.33

5.44	Average foot-candles.
4.51	Minimum foot-candles.
6.85	Maximum foot-candles.

Finishing tables—Angle of glare.—

$$\theta_2 = 180^\circ - \tan^{-1}\frac{2.5}{4.5-(3.5-2.58)} = 180^\circ - \tan^{-1}.700$$

$$\theta_2 = 145$$

$$\theta_3 = 45^\circ$$

$$\theta = 100^\circ$$

Illumination in foot-candles.—

2.56
9.26
17.30

29.12

9.71	Average.
17.30	Maximum.
2.56	Minimum.

Basting table—Angle of glare.—Lights from cutting table.

$$\theta_2 = 180^\circ - \tan^{-1}\frac{9}{2.97-\left(\frac{63}{12}-\frac{30.5}{12}\right)} = 92^\circ.$$

$$\theta_3 = \tan^{-1}\frac{2.58}{\frac{63}{12}-\frac{30.5}{12}} = 43.6^\circ.$$

$$\theta = 92^\circ - 43.6^\circ = 48.4^\circ.$$

Illumination in foot-candles.—

Daylight.		Daylight and artificial light.	
Foot-candles.		*Foot-candles.*	
0.525		0.672	
.434		.584	
.417		.642	
1.376		1.898	
.459	Average.	.633	Average.
.525	Maximum.	.672	Maximum.
.417	Minimum.	.584	Minimum.

Cutting table—Angle of glare.—

$$\theta_2 = 180^\circ - \tan^{-1}\frac{3.5}{2.5-\left(\frac{63}{12}-\frac{34}{12}\right)} = 91.3^\circ.$$

$$\theta_3 = \tan^{-1}\frac{7}{2.42} = \tan^{-1}2.89 = 71^\circ.$$

$$\theta = 91.3 - 71 = 20^\circ.$$

Illumination in foot-candles.—Lgc ygt is a multiplying factor of 0.038 for the detached plate.

Daylight.	Daylight and artificial light.
Foot-candles.	*Foot-candles.*
0.111 .152 .159 .146 .150	4.18 4.62
.718	8.80
.144 Average. .159 Maximum. .111 Minimum.	4.40 Average. 4.62 Maximum. 4.18 Minimum.

Albedo of walls and ceiling.—Ceiling is approximately the same as he walls.

$$m=\frac{\pi b}{E}=\frac{\pi\times144\times3.31\times.0004}{3.37\times.210}=.847$$

The factor .0004 is that given by the Bureau of Standards for inrinsic brilliancy in candle-power per square inch. The factor .210 s that given by the Bureau of Standards for foot-candles using the etached test plate.

Illumination on stairs in foot-candles.—

$$\frac{2.20}{.44}\times.079=.0396.$$

The albedo of the cloth samples was measured at the Hygienic aboratory and is given in Table 1, Appendix C. The method of easurement was the same as that for measuring the albedo of the alls and ceiling.

Outside illumination.—

3.00 p. m.
$1.96\times165=323$ foot-candles.
3.20 p. m.
$4.11\times165=679$ foot-candles.

APPENDIX C.

TABULATION OF DATA SECURED IN PHOTOMETRIC SURVEY OF A GROU OF 34 WORKSHOPS TYPICAL OF THE WOMEN'S GARMENT INDUSTRY NEW YORK CITY, N. Y.

GLOSSARY OF ABBREVIATIONS IN TABLES.

Arrangement of working planes:
- ⊥-w=perpendicular to window.
- ‖-w=parallel to window.
- C=center.

Arrangement of lamps:
- CL=center line fixed.
- AF=aisle fixed.
- CLD=center line drop.
- DD=double rows drop.
- DF=double rows fixed.
- DA=double rows adjustable.
- AD=aisle drop.
- ED=off center drop.
- EF=off center fixed.

REFLECTOR NOTATION.

(See Appendix E.)

Color of walls of stairs:
- Br=brown, dark.
- Bl=black.
- W=white.
- Rd=red, dark.
- Bf=buff.
- Al=aluminum finish.
- G=gray, dark.

Floor:
- Ba=basement.

Finish of walls and ceiling:
- Ma=mat alabastine.
- Mw=whitewash.
- P=paint.

Window glass:
- W=$\frac{1}{8}$-inch window glass.
- P=$\frac{1}{4}$-inch plate glass.

Window glass—Continued.
- WC=factory clear fire wire glass.
- FW=frost factory fire wire glass.
- R=ribbed prismatic glass.
- WR=factory wire fire ribbed glass.

Condition of glass:
- VD=very dirty.
- D=dirty.
- F=fair.
- C=clean.

Color of opposite buildings:
- R=red.
- Gl=light gray.
- Gd=dark gray.
- W=white.

Color of walls and ceiling:
- W=white.
- D=drab.
- G=gray.
- Gr=green.
- Grd=green, dark.
- Bd=dark brown.

Material of walls and ceiling:
- P=plaster.
- S=steel.
- B=brick.
- W=wood.

Industry:
- C=coats.
- S=suits.
- D=dress.
- W=waists.
- M=manteaux.
- Bh=buttonhole.

TABLE No. 1.—*General data.*

Shop No.	Number of windows.				Window area.				Sky angle.				Type of glass.				Opposite buildings.				Condition of glass.
	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	E.	W.	N.	S.	
1	3	4	0	0	80.4	69.5			17.5	17.5			W	W	O	O	R	R			VD
2	3	3	0	0	96.6	73.4			78	85			W	W	O	O	R	R			D
3	5	4	0	0	121	142			79	60.5			W	W	O	O	R	R			VD
4	4	4	0	0	154	110			68	72.5			W	W	O	O	R	R			VD
5	0	0	4	4			106.8	144.2			66	56	O	O	W	W			Gl	R	VD
6	5	6	0	0	122	152.2			35.5	0			W	W	O	O	R	Gl	O	O	F
7	10	0	5	0	403		223		35		58		P	O	P	O	Gl	O	Gl	O	D
8	0	3	12	5		69.5	276	334		76	61.5	0	O	WC	WC	P	O	R	Gl	Gl	D
9a	0	3	15	14		50.6	436	464		90	74.3	90	O	WC	W	WC	O	Gl	Gl	R	F
9b	0	3	15	15		50	353	410		90	80.5	90	O	WC	W	WC	O	Gl	Gl	R	C
9c	0	0	15	13			452	285			53	0	O	O	P	WC	O	O	Gl	W	C
10a	5	6	5	8	57.8	76	146	154					WC	WC	W	WC	R	Gl	Gd	Cl	C
10b	5	6	5	8	57.8	76	116	154	74.5	77	64	85.5	WC	WC	W	WC	R	Gl	Gd	Gl	C
10c	5	6	5	8	97	119	113	116	83	82.5	81.5	87	WC	WC	W	WC	R	Gl	Gd	Gl	C
11a	2	3	7	6	48	67	131	158	0	0	0	47.5	R	W	W	W	Gl	Gl	Gl	Gl	F
11b	4	3	7	4	45	31	119	147	0	0	0	57.5	W	W	W	W	Gl	Gl	Gl	Gl	F
12	6	0	6	5	90		126	69.0	73.5		51.5	0	WR	O	W	WR	R	O	W	Gl	D
13	5	0	6	5	75.0		90	68.7	73.5		52	0	WR	O	W	WR	R	O	W	Gl	F
14	0	4	3	4		29.2	73.2	89		0	30	0	O	W	W	FW	O	W	W	Gl	D
15	0	5	3	4		82.3	73.2	88.8		0	28	0	O	FW	W	W	O	R	W	Gl	W-D, C
16	0	2	6	7		46	230.6	149.7		0	31	0	O	FW	W	FW	O	R	W	W	N-C, D
17	0	6	7	10		95	163	148.5		22	50.5	56.5	O	FW	FW	P	O	R	Gl	Gl	P-C, D
18	0	0	7	10			163	148.5			0	27	O	O	FW	P	O	O	Gl	Gl	D
19	11	6	9	8	267	145	224	145	82.5	78.5		87.2	WC	WC	W	W	R	Gl	Gl	Gl	D
20	2	0	11	7	46.7		181.3	163	0		0	81.5	FW	O	W	FW	W	O	Gl	W	W-F, D
21	2	1	5	7	19.4	9.6	85	184	0	0	0	85	FW	FW	FW	W	W	Gl	Gl	Gl	W-F, D
22	2	3	5	7	19.4	28.8	85	184	0	0	0	89.5	FW	FW	FW	W	W	Gl	Gl	Gl	D
23	6	4	6	8	163	77	164	184	0	0	41.5	38	FW	FW	FW	W	Gl	Gl	Gl	Gl	W-F, D
24	6	4	6	8	163	77	164	184	0	0	57	54	FW	FW	FW	W	Gl	Gl	Gl	Gl	W-F, D
25a	3	6	8	7	18.9	56.3	196.4	132.2					W	W	W	W	R	R	R	R	D
25b	0	2	4	3	18.3	18.8	98.4	56.7		0	0	0	O	W	W	W	R	R	R	R	D
25c	3	6	8	7	18.9	56.3	196.4	132.2	0	0	57	0	W	W	W	W	R	R	R	R	D
25d	6	6	8	7	47	56.3	151.4	132.3					W	W	W	W	R	R	R	R	D
25e	6	6	8	7	47	56.3	151.4	132.3					W	W	W	W	R	R	R	R	D
25f	5	6	8	7	47	56.3	151.4	132.3	90	90	90	90	W	W	W	W	R	R	R	R	D
26	0	0	3	4			57	113			0	53	O	O	W	P	O	O	R	R	D
27	0	2	4	4		14.6	46.6	78.0		0	0	0	O	W	W	W	O	Gl	Gl	W	F
28	0	0	0	1				9.8				0	O	O	O	W	O	O	O	W	D
29a	0	0	0	2				19.6				0	O	O	O	W	O	O	O	W	D
29b	1	0	0	4	22.5			126	0			0	FW	O	O	FW	R	O	O	R	D
30	0	0	3	3			51	72			0	63	O	O	W	W	O	O	R	R	D
31	3	0	4	4	55.3		81.0	73.7	0		43	66	FW	O	W	FW	R	O	R	R	D
32	1	1	8	5	19.7	19.7	158	243.7	0	0	0	0	FW	FW	FW	P	Gl	Gl	W	W	D
33a	1	11	8	7	18	198	236	239	79	85	63	80	W	W	W	P	W	Gd	R	W	F
33b	1	8	0	7	18	144		239	90	90		90	W	W	O	P	W	Gd	O	W	F
34	0	3	12	12		54	215	410		0	0	50.5	O	W	W	P	O	Gd	R	R,Gd	D
Total	121	146	261	266	2,036	2,398	6,111	6,514													
Average																					
Maximum																					
Minimum																					

Shop No.	Length, maximum.	Width, maximum.	Height of ceiling.	Floor area.	Total window area.	Floor area—window area.	Effective window area—total window area.	Color.		Material.		Finish.		Number of—			Albedo, per cent.			Floor.	Remarks.	Industry.
								Walls.	Ceiling.	Walls.	Ceiling.	Walls.	Ceiling.	Elevators.	Stairs.	Fire escapes.	Walls.	Ceiling.	Material.			
	Feet.	*Feet.*	*Feet.*	*Sq. ft.*	*Sq. ft.*																	
1	82.5	22.1	10	1,822	150	12.2	0.486	W	W	P	P	Ma	Ma	0	1	1	70	70	2–73	3		C, S.
2	80	28	11	2,060	170	12.1	.813	W	W	P	P	Mw	Mw	1	1	1	59	59		5		C, S.
3	80	38	11.5	3,040	263	11.6	.732	W	W	P	P	Ma	Ma	1	1	2	49	49	4	6		W.
4	80	38	11.5	3,040	264	11.6	.563	W	W	P	P	Mw	Mw	1	1	1	68	68		4		C.
5	80	32	11.5	2,560	251	10.2	1.00	W	W	P	P	Ma	Ma	1	1	2	84	84	2–15	3		C.
6	80	44.5	10	3,560	274.2	13.0	.630	W	D	P	P	Mw	Mw	1	1	2	72	72		4		C.
7	90	40	11	3,600	625	5.8	.942	W	W	P	P	Ma	Ma	3	1	2	90	90	0.6–4	2		C, S.
8	100	100	11.5	10,000	679.5	14.7	.706	W	W	P	P	Ma	Ma	4	3	1	80	80		3		C, S.
9a	100	80	10.7	8,000	950.6	8.4	.541	W	W	P	P	Ma	Ma	4	2	2	62	62	1–82	4	In showroom N sky angle is O	C, S.
9b	100	80	10.7	7,360	813	9.0	1.00	W	W	P	P	Ma	Ma	4	2	2	62	62	1–82	5		C, S.
9c	108	80	11	7,800	737	10.6	1.00	W	W	P	P	Ma	Ma	4	2	2			1–82	5		C, S.
10a	80	46.5	11.2	3,340	434	7.7	1.00	W	W	P	P	Ma	Ma	3	2	1			2–3	10	Illumination not measured.	C, S.
10b	80	46.5	11.2	3,340	434	7.7	1.00	W	W	P	P	Ma	Ma	3	2	1			2–3	11		C, S.
10c	80	46.5	11.2	3,340	466	7.2	1.00	W	W	P	P	Ma	Ma	3	2	1	85	85	2–3	12		C, S.
11a	80	46.5	12	3,570	404	8.8	1.00	W	W	P	P	Ma	Ma	2	1	1	79	79	2–19	2		C, S.
11b	80	46.5	12	3,400	342	9.9	1.00	W	W	P	P	Ma	Ma	2	1	1	80	80	2–19	3		C, S.
12	88	38.5	9.5	2,450	285	8.6	.780	W	D	P	S	Ma	P	1	1	2	63	63	2–4	5		C, S.
13	88	38.5	9.25	3,060	234	13.1	.871	W	D	P	S	Ma	P	1	1	2	82	82	2–3	6		C, S.
14	84.25	30.66	10.25	2,370	191.4	12.4	.536	W	W	P	P	Ma	Ma	1	1	1	88	88	0.3–2	4		C, S.
15	85	31	10.25	2,626	214	10.8	.635	W	W	P	P	Ma	Ma	1	1	1	85	85	0.2–22	5		C, S.
16	87.5	47.5	12.25	3,588	436.3	8.2	.800	W	W	P	P	Ma	Ma	2	1	1	67	67	2–6	2	Office and showroom, all FW dirty.	C, S.
17	100	50	11.25	4,852	406.5	12.0	.734	W	W	P	P	Ma	Ma	3	2	1	85	85	2–39	4		C, S.
18	100	50	11.25	4,852	311.5	15.6	.654	W	W	P	P	Ma	Ma	3	2	1	86	86		2		C.
19	195	57	11	11,100	781	14.2	.713	W	W	P	P	Ma	Ma	5	3	2	73	73		8		C, S.
20	80	67.5	11.5	6,120	391	15.6	.691	W	W	P	P	Ma	Ma	3	1	2			2–15	3	Sky angle will soon be 0 as new building is going up.	Md.
21	78	47	11	3,386	298	11.4	.559	W	W	P	P	Ma	Ma	3	1	1	81	81		5	do	W.
22	78	47	11	3,386	317.2	10.7	.833	W	W	P	P	Ma	Ma	3	1	1	76	76	41–80	8		M.
23	86	47	11.25	3,726	588	6.34	.697	W	W	P	P	Ma	Ma	3	1	1	73	73		3		C, S.
24	86	47	11.25	3,726	588	6.34	.805	W	W	P	P	Ma	Ma	3	1	1				6		D.
25a	63.5	45	9.4	3,110	403.8	7.72	1.00	D	G	B	S	P	P	1	1	3			0.1–9	2	Office and showroom; illumination not measured.	C.
25b	63.5	23	9.4	1,450	183.3	7.9	1.00	D	G	B	S	P	P	1	1	3	17.2		0.1–9	3	One-half of loft	C.
25c	63.5	45	9.4	3,110	403.8	7.72	1.00	D	G	B	S	P	P	1	1	3	17.2	17.2	0.1–9	4		C.
25d	63.5	45	9.4	3,110	387	8.04	1.00	D	B	B	W	P	P	1	1	3	17.2		0.1–9	5		C.
25e	63.5	45	9.4	3,110	387	8.04	1.00	D	G	B	S	P	P	1	1	3	17.2		0.1–9	6		C.
25f	63.5	45	9.4	3,110	387	8.04	1.00	D	G	B	S	P	P	1	1	3	17.2		0.1–9	7	118 square feet of skylight	C.
26	61.25	22	9	1,195	170	7.03	1.00	W	Gr	P	S	Ma	P	0	2	1	90	90		3		C, S.
27	87	22	9.5	1,736	139.2	12.5	.579	W	G	P	S	Ma	P	1	1	1		56	3–65	3		D.
28	25.5	11.5	8.5	293	9.8	30	1.00	W	Gr	B	S	Mw	P	0	0	2	76			B.		Bh.
29a	22	14.5	8.5	319	19.6	16.3	1.00	W	Gr	B	S	Mw	P	0	1	0	76–18			B.		D.
29b	23	22	12	506	148.5	3.42	1.00	Grd.	W	Pap.	P	Paper.	Ma	0	0	2	39			1		D.
30	48.5	24.25	10	959	123	7.8	.805	W	W	P	S	Ma	P	0	1	2	77		2	3		C, S.
31	87	24	10.5	1,946	210	9.3	.806	W	W	B	P	P	Ma	0	1	1	66			3		C, S.
32	83	47.75	11.5	3,638	441	8.24	.579	W	W	P	P	Ma	Ma	2	1	1	83	83		3		C, S.
33a	197.75	48	11.25	9,420	691	13.6	1.00	W	W	P	P	Ma	Ma	3	2	1			2–75	4		D.
33b	100	48	11.25	4,800	401	12.0	.466	W	W	P	P	Ma	Ma	3	2	1	67	67	2–75	5		D.
34	100	100	11.5	9,760	679	14.4	.710	W	D	P	S	Ma	P	1	2	4	64		2–32	2	One-half of south windows sky angle=O.	D.
Total	83.4	44.5	10.6	3,840	381	10.6	.825										65	73				
Average						30.0	1.00															
Maximum						3.4	.486															
Minimum																						

TABLE No. 2.—*Cutting-table data.*

Shop No.	Table No.	Length.	Width.	Height.	Area.	Location of tables.	Number of outlets for lamps.	Size of lamps.	Type of lamps.	Percentage of lamps that will light.	Type of reflectors.	Number of bare lamps.	Height above table.	Watts per square foot.	Cubic feet per hour per square foot.	Arrangement of outlets.	Angle of glare.	Illumination, average in foot-candles, daylight.	Illumination, maximum in foot-candles, daylight.	Illumination, minimum in foot-candles, daylight.	Illumination, average in foot-candles, daylight and artificial light.	Illumination, maximum in foot-candles, daylight and artificial light.	Illumination, minimum in foot-candles, daylight and artificial light.	Number of cutters.	Lights on during observation.	Floor.	Remarks.
		Feet.	*Feet.*	*Inches.*	*Sq. ft.*								*Feet.*				*Deg.*										
1	1	25	6.75	35	169	⊥-C	2	6 cubic feet 13 cubic feet	Flat flame Gas arc	100	0	2	3.8	......	0.112	CLF	42	......	......	......	4.0	12.9	1.1	2	2	3	
2	1	28	6.40	46	179	⊥-W	1	do.	do.	100	0	1	3.0	......	.073	CLF	31	12.0	34	0.5	......	......	......	1	0	5	
3	1	35.3	3.25	32	115	⊥-W	2	do.	do.	100	0	2	4.7	......	.226	AF	57	16.4	71	.76	......	......	......	1	0	6	Lights in aisle.
4	1	15.6	5.75	33	89.6	⊥-C	2	6 cubic feet	Flat flame	100	0	2	2.8	......	.134	CLF	30	......	......	......	1.3	2.7	.7	1	2	4	
5	1	22.4	6	35	134	⊥-W	4	do.	do.	100	0	4	2.9	......	.179	CLF	32	32.2	96	2.3	......	......	......	1	0	3	
6	1	23.9	6.17	35	147	⊥-W	1	13 cubic feet	Gas arc	100	0	1	4.5	......	.088	CLF	56	6.2	20	.5	......	......	......	1	0	4	Opal globe.
7	1	23.3	5.83	33	136	⊥-C	2	100-watt	Tungsten	50	0	1	2.7	0.735	......	CLD	27	......	......	......	2.9	4.2	1.6	2	1	2	
8	1	55	6.67	33	367	⊥-W	4	do.	do.	75	XE60	0	5.6	.818	......	CLD	64	......	......	......	3.4	11.0	.2	4	3	3	
8c	2	16.7	3.12	33	52.1	‖-C	2	do.	do.	50	XE60	0	5.6	1.92	......	CLD	102	......	......	......	1.4	2.8	.1	1	1	3	
9c	1	57	6.50	35	370	‖-W	5	do.	do.	60	C17	0	3.7	.810	......	CLD	43	......	......	......	3.2	10.0	.4	4	3	5	
9c	2	57	6.50	35	370	‖-W	4	do.	do.	100	C17	0	3.7	1.08	......	CLD	43	1.6	2.2	1.2	......	......	......	4	0	5	
9c	3	57	6.50	35	370	‖-C	5	do.	do.	100	C17	0	3.7	1.35	......	CLD	43	2.6	4.9	.9	......	......	......	4	0	5	
9c	4	57	6.50	35	370	⊥-W	5	do. 60-watt	do.	100	C17	0	3.7	1.03	......	CLD	43	12.4	25.0	6.0	......	......	......	4	0	5	
9c	5	36	3.20	33	115	⊥-W	3	100-watt	do.	100	C17	0	3.7	2.61	......	CLD	75	4.6	14.5	1.0	......	......	......	2	0	5	
9c	6	36	3.20	33	115	⊥-W	3	do.	do.	100	C17	0	3.7	2.61	......	CLD	75	8.1	27.0	1.0	......	......	......	2	0	5	
10b	1	43	5.83	34	251	⊥-W	4	do.	do.	25	E9	0	5.75	.457	......	AD	43	23.4	31.2	11.5	......	......	......	4	0	11	Lights between aisles of tables.
10b	2	43	5.92	33	255	⊥-W	2	do.	do.	50	E9	0	5.75	.457	......	AD	71	......	......	......	......	......	......	4	......	11	
10b	3	43	6.25	34	269	⊥-W	3	do.	do.	66.6	E9	0	5.75	.457	......	AD	41	24.0	57.4	3.2	......	......	......	4	0	11	
10b	4	37.4	5.91	33	221	⊥-W	2	do.	do.	50	E9	0	5.75	.457	......	AD	52	......	......	......	......	......	......	4	0	11	
10b	5	29.8	3.25	33	97	⊥-W	......	......	......	......	......	......	3.67	.457	......	AD	75	2.1	5.0	.8	......	......	......	4	0	11	
11a	1	40.5	5.50	34	223	‖-W	6	100-watt 150-watt	Tungsten	83.5	HM60	1	3.67	2.92	......	CLD	29	......	......	......	5.2	7.8	3.8	2	5	2	Maximum, 4.25 feet; minimum, 2.66 feet.
11a	2	23.0	5.50	34	126	‖-C	3	100-watt	do.	100	HM60	0	3.88	2.78	......	CLD	47	......	......	......	4.9	6.6	2.8	2	3	2	Maximum, 4.16 feet; minimum, 3.50 feet.
11a	3	26.0	6	34	156	⊥-W	2	150-watt do.	do.	100	HM60	0	5.34	1.92	......	CLD	66	......	......	......	3.7	4.6	2.5	2	2	2	
11a	4	26	5.50	34	143	⊥-W	2	do.	do.	100	HM60	0	4.75	2.10	......	CLD	64	......	......	......	3.5	4.6	1.6	2	2	2	
12	1	30.5	6.70	34	204	‖⊥-W	2	400-watt 13 cubic feet	Arc	50	0	2	7	0	.003	AF	48	1.3	2.1	.65	3.0	4.5	2.1	4	1	5	Thompson inclosed 220V arc lamp.
13	1	32.75	5.25	33	172	⊥-W	3	100-watt 60-watt	Tungsten Carbon	100	0	3	3.22	1.51	......	CLD	11	1.9	3.1	1.1	......	......	......	2	0	6	Maximum, 4.67 feet; minimum, 1.83 feet.
13	2	36.0	4.92	35	177	⊥-W	1	do.	do.	100	0	1	1.17	0.34	......	CLD	0	1.0	2.6	.65	......	......	......	2	0	6	
14	1	24.7	6.67	35	165	‖-W	2	100-watt	Tungsten	50	0	2	4	.605	......	CLD	46	4.0	5.0	2.3	......	......	......	1	0	4	
15	1	20.5	7.0	34	143	C	2	do.	do.	100	HM60	0	2.5	1.40	......	CLD	20	.14	.16	.11	4.4	4.6	4.2	2	2	5	
16	1	26.2	6.58	32	172	‖-W	3	60-watt	do.	33.3	HM60	1	3	.349	......	CLD	29	2.8	5.3	1.3	......	......	......	1	0	2	
16	2	24.7	6.50	32	160	⊥-C	3	100-watt	do.	33.3	HM40	1	3	.625	......	CLD	29	1.7	1.8	1.6	......	......	......	2	0	2	
17	1	36	6	34	216	⊥-W	3	do.	do.	100	C9½	0	4	1.39	......	CLD	50	3.8	13.5	.50	8.3	14.5	1.7	2	3	4	
18	1	20	6.17	33	123	⊥-C	3	60-watt	do.	33.3	HM60	0	4.5	.488	......	CLD	55	.30	.61	.11	1.3	1.7	.79	2	1	2	
18	2	24	6.17	33	148	⊥-C	3	do.	do.	66.6	HM60	1	4.5	.812	......	CLD	55	.19	.29	.06	.70	1.0	.33	2	2	2	
19	1	32	2.58	35	82.5	‖-C	3	100-watt	do.	100	F9	0	7	3.64	......	CLD	87	14.3	21.0	7.0	......	......	......	2	0	8	
19	2	42	5	34	210	‖-C	5	do. 60-watt	do.	60	F9	0	7	1.24	......	CLD	88	1.7	2.0	1.5	......	......	......	2	0	8	
19	3	42	5	34	210	‖-C	5	100-watt	do.	100	F9	0	7	2.38	......	CLD	88	.77	1.2	.40	......	......	......	2	0	8	
19	4	21	5.08	34	107	⊥-W	3	do. 60-watt	do.	66.6	F9	0	7	1.50	......	CLD	88	5.6	9.0	2.2	......	......	......	2	0	8	
19	5	21	5.08	34	107	⊥-W	3	100-watt 60-watt	do.	66.6	F9	0	7	1.50	......	CLD	88	5.8	9.8	1.9	......	......	......	2	0	8	
19	6	21	5.08	34	107	⊥-W	3	100-watt	do.	100	F9	0	7	2.80	......	CLD	88	17.6	31.7	3.5	......	......	......	2	0	8	
19	7	21	5.08	34	107	⊥-W	3	do.	do.	100	F9	0	7	2.43	......	CLD	88	36.4	68	5.0	......	......	......	2	0	8	
19	8	21	5.08	34	107	⊥-W	3	60-watt 100-watt	do.	33.3	F9	0	7	9.35	......	CLD	88	37.7	72	3.4	......	......	......	2	0	8	
19	9	32.8	4.83	33	158	‖-C	4	do.	do.	50	F9	0	7	1.26	......	CLD	90	1.8	2.4	.82	......	......	......	2	0	8	
19	10	32.8	4.83	33	158	‖-C	3	do. 60-watt	do.	100	F9	0	7	1.65	......	CLD	90	1.1	1.3	.90	......	......	......	2	0	8	
20	1	35	6.17	36	216	⊥-W	4	100-watt	do.	100	0	4	2.75	1.85	......	CLD	29	1.6	5.6	.35	5.4	10.2	3.4	1	4	3	
20	2	24	3.33	36	80	⊥-W	2	do. 60-watt	do.	100	0	2	2.75	2.00	......	CLD	50	......	......	......	3.4	5.6	1.3	1	2	3	
20	3	24	3.17	35	76	⊥-W	0	......	......	0	0	0	0	0	......	......	......	......	......	......	......	......	......	1	......	3	
21	1	36.2	6.83	33	248	⊥W	5	100-watt	Tungsten	100	C10	0	2.67	2.02	......	CLD	−10	1.0	2.9	.30	11.7	51	4.5	2	5	5	Maximum, 5 feet; minimum, 0.5 feet.
22	1	16	7	34	112	‖-W	3	do.	do.	66.6	C10	1	2.58	1.79	......	DD	22	163	305	22.0	......	......	......	1	0	8	
23	1	12	6	32	72	⊥-W	1	13 cubic feet	Gas arc	100	0	1	4.17	......	.181	CLF	51	......	......	......	4.4	10.1	.65	1	1	3	Opal globe.
23	2	20	4.83	32	96.6	⊥-W	2	100-watt 60-watt	Tungsten	100	HM60	0	2.83	1.65	......	CLD	34	1.4	1.7	1.2	......	......	......	2	0	3	
23	3	20	4.83	32	96.6	⊥-W	2	100-watt	do.	100	HM60, C10	0	2.25	2.07	......	CLD	20	.76	1.0	.55	......	......	......	1	0	3	
24	1	24.2	7.42	35	180	‖⊥-W	3	150-watt	do.	66.6	B12	0	2.75	1.67	......	CLD	24	1.8	3.9	.80	......	......	......	2	0	6	All frost.
25c	1	41.5	6.25	32	259	‖⊥-W	2	250-watt	do.	50	D18	0	3.83	.965	......	CLF	44	2.0	3.7	.70	......	......	......	2	0	4	
25c	2	22	6.42	31	141	‖⊥-W	1	do.	do.	100	D18	0	3.83	1.77	......	CLF	42	16.6	20.6	13.0	......	......	......	2	0	4	
25c	3	11	4.75	36	52.2	‖-W	1	do.	do.	100	0	1	3	4.80	......	CLF	43	21.1	31.1	11.2	......	......	......	2	0	4	
25c	4	20	3.42	36	68.4	‖-W	2	100-watt	do.	50	D18	1	3.50	1.46	......	CLF	70	......	......	......	......	......	......	2	0	4	
25d	1	17	5.50	32	93.5	‖-W	1	do.	do.	0	0	0	4	0	......	CLF	52	......	......	......	......	......	......	1	......	5	
25d	2	40.7	6.42	33	261	‖-W	2	60-watt	do.	100	D18	0	4	.766	......	CLF	32	30.1	62.7	1.9	......	......	......	3	0	5	Height to reflector.
25d	3	19.2	4.83	33	92.6	‖-W	1	100-watt	do.	100	D18	0	4	1.08	......	CLF	44	20.7	27.0	14.0	......	......	......	2	0	5	
25d	4	26	6.17	32	160	‖-C	2	250-watt	do.	100	D18	0	4	3.12	......	CLF	34	4.7	8.5	1.5	......	......	......	2	0	5	
25d	5	53	6.58	31	348	‖⊥-W	3	do.	do.	100	D18	0	4	1.26	......	CLF	31	5.1	9.6	1.6	......	......	......	6	0	5	
25d	6	22.8	6.17	33	138	⊥-W	1	100-watt	do.	100	D18	0	3.58	.725	......	CLF	26	16.8	48	.65	......	......	......	2	0	5	
26	1	20.8	6	35	124	⊥-C	2	3.3 cubic feet	Reflex	100	0	2	1.92	......	.0532	CLF	14	1.2	2.6	.10	......	......	......	2	0	3	Opaline globes.
27	1	27.8	3.42	31	95.0	⊥-C	4	6 cubic feet	Flat flame	100	0	4	3.5	......	.252	CLF	64	.05	.10	.01	.90	1.3	.54	1	4	3	
29	1	14.8	6	34	88.5	⊥-W	2	100-watt	Tungsten	100	C8	0	2.83	2.26	......	CLD	29	5.0	16.2	.096	7.3	17.0	1.5	1	2	B	Shades made of paper.
30	1	10.8	6	35	65.1	⊥-C	2	do.	do.	100	HM60	0	2.33	3.07	......	CLD	23	2.1	3.4	1.0	......	......	......	2	0	3	
31	1	23.8	6	34	143	⊥-W	3	do.	do.	100	0	3	2.67	2.10	......	CLD	26	20.0	63	.70	......	......	......	2	0	3	
32	1	31.8	6	34	191	⊥-C	4	do.	do.	75	0	4	.67	1.57	......	EF	− 8	.28	.90	.09	......	......	......	2	0	3	Maximum, 3 feet; minimum, 1 foot.
33a	1	24	6	31	144	⊥-C	2	50-watt	Gem	100	C8	0	2	.695	......	CLD	12	......	......	......	......	......	......	2	0	4	
33a	2	22	6.50	33	143	⊥-C	1	do. 100-watt	do. Tungsten	100	C8	0	2.83	.350	......	CLD	27	3.3	6.0	1.4	......	......	......	2	0	4	
33a	3	48.2	6.67	34	322	⊥-W	5	50-watt 100-watt	Gem Tungsten	80	D14	3	4.5	.934	......	CLD	31	7.0	14.0	2.3	......	......	......	2	0	4	Maximum, 6 feet; minimum, 3 feet.
33a	4	48.2	3.17	32	153	⊥-W	7	50-watt 100-watt	Gem Tungsten	71.5	C8	4	4.5	1.96	......	CLD	54	......	......	......	......	......	......	2	0	4	Do.
34	1	72	3.42	32	246	‖-C	5	50-watt	Gem	80	H9673	4	2.67	1.01	......	CLD	40	......	......	......	.49	.85	.30	2	4	2	
34	2	72	3.42	32	246	‖-C	0	0	0	0	0	0	0	0	......	......	......	.28	.44	.10	......	......	......	2	0	2	
34	3	33	6	32	198	‖-C	0	0	0	0	0	0	0	0	......	......	......	1.8	2.8	1.2	......	......	......	2	0	2	
		30.62	5.48	33.6	169.2	......	2.69	......	......	82	......	.78	3.94	1.49	.184	......	47.2	8.7	17.8	2.4	3.8	8.8	1.6	2	......	......	Average.

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TABLE NO. 3.—*Basting-table data.*

Shop No.	Table No.	Length.	Width.	Height.	Area.	Location of tables.	Number of outlets for lamps.	Location of lamps.	Size of lamps.	Per cent of lamps that will light.	Type of reflectors.	Number of bare lamps.	Height above table.	Watts per square foot.	Angle of glare (degrees).	Illumination average in foot-candles, daylight.	Illuminationmaximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight and artificial light.	Illumination maximum in foot-candles, daylight and artificial light.	Illumination minimum in foot-candles, daylight and artificial light.	Lights on during observations.	Floor.
		Feet.	*Feet.*	*Inches.*	*Sq. ft.*								*Feet.*										
9a	1	23.2	3.75	36.5	87.0	C	5	CLD	60-watt T	80.0	3-C-10 1-S-11	1	1.80	2.76	18.3	1.4	2.2	0.75				0	4
9a	2	21.2	3.8	36.5	79.5	C	3	CLD	60-watt T	100	C-10	1	1.80	2.26	18.3				2.7	7.3	.63	2	4
9a	3	6.8	3.8	37	25.5	C	1	AD$_1$	60-watt T	100	0	1	3.80	2.35	49				7.1	8.7	4.1	4	4
9a	4	6.8	2.9	37	19.8	TW	1	CLD	6o-watt T	100	C-17	0	3.30	3.03	74	109						0	4
9b	1	14.3	5.5	39	78.6	C	3	CLD	60-watt T	100	2-S-11	1	3.09	2.30	46				3.7	5.1	1.1	3	5
9b	2	28.6	5.5	39	157	C	1	CLD	60-watt T	100	0	1	2.75	0.38	35				1.7	2.8	1.1	1	5
9b	3	14.9	3.6	39	53.6	C	2	CLD	60-watt T	50	S-11	1	2.75	1.12	52	2.0	3.6	0.40				0	5
9b	4	14.9	3.6	39	53.6	C	2	CLD	60-watt T	100	0	2	2.75	2.24	52				1.7	2.6	.85	1	5
9c	1	13.2	5.9	38.5	78.0	C	2	CLD	100-watt T	100	C-17	0	3.58	2.57	47				7.1	12.0	1.7	2	5
9c	2	13.2	5.9	38.5	78.0	C	2	CLD	60-watt T	50	1-D-14	1	4.12	1.54	54				1.7	2.7	1.0	1	5
10c	1	6.25	4.0	37	25.0	C	1	AD$_1$	60-watt T	100	0	1	3.00	2.40	38	2.6	3.6	1.6				0	12
10c	2	8.0	2.7	31	21.3	C	1	AD$_1$	60-watt T	100	0	1	3.00	2.82	50	1.4	1.6	1.2				0	12
11b	1	11.8	5.0	36	59.2	C	2	CLD	60-watt T	50	M-60	0	5.75	1.01	72				2.5	2.7	2.0	1	3
11b	2	12.0	3.3	36	40.0	C	2	CLD	100-watt T	100	M-60	0	4.58	5.00	82				6.4	8.6	4.4	2	3
11b	3	12.0	3.3	36	40.0	C	2	CLD	150-watt T	100	M-60	1	4.00	7.50	80				7.0	11.2	4.6	2	3
11b	4	12.0	3.3	36	40.0	C	2	CLD	100-watt T	100	M-60	1	4.17	5.00	83				4.0	4.4	3.9	2	3
13	1	8.0	2.8	30	22.6	C	1	CLD	100-watt T	100	0	1	5.50	4.42	107	1.2	1.3	1.1				0	6
14	1	10.3	2.5	32	25.8	C	0							0		2.0	2.4	1.6				0	4
15	[1] 1	17.7	2.6	30.5	45.6	C	3	AD$_4$	100-watt T	100	M-60	0	7.00	6.58	48	0.46	0.52	0.42	0.63	0.67	0.58	3	5
16	1	15.3	3.2	34	49.9	C	2	CLD		0	0	2	1.92	0	20	1.1	1.4	0.80				0	2
16	2	15.3	3.2	34	49.9	C	2	CLD	40-watt T	50	C-8	1	1.92	0.80	20	0.62	0.75	0.50				0	2
16	3	15.3	3.2	34	49.9	C	1	CLD	60-watt T	100	M-40	0	4.00	1.20	81							0	2
17	1	18.2	2.3	35	42.4	C	0							0		3.6	3.9	3.3				0	4
17	2	8.0	3.2	36	35.3	C	0							0		2.8	3.8	1.8				0	4
19	1	7.0	3.0	36	21.0	C	1	CLD	100-watt T	100	C-10	0	6.00	4.76	106	0.86	1.1	0.65				0	8
19	2	5.0	2.0	36	10.0	C	2	CLD	100-watt T 60-watt T	100	C-10 F-9	0	6.00	16.0	123	0.37	0.40	0.35				0	8
23	1	7.0	3.2	34	22.2	C	1	ED	60-watt T	100	M-40	0	2.42	2.70	37	0.88	1.2	0.60				0	3
23	2	7.0	3.2	34	22.2	C	1	ED	60-watt T	100	M-40	0	2.42	2.70	37	0.58	0.70	0.47				0	3
23	3	7.0	3.2	34	22.2	C	0					0		0		0.44	0.55	0.32				0	3

[1] 4-feet horizontal distance.

TABLE No. 3.—*Basting-table data*—Continued.

Shop No.	Table No.	Length.	Width.	Height.	Area.	Location of tables.	Number of outlets for lamps.	Location of lamps.	Size of lamps.	Per cent of lamps that will light.	Type of reflectors.	Number of bare lamps.	Height above table.	Watts per square foot.	Angle of glare.	Illumination average in foot-candles, daylight.	Illumination maximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight and artificial light.	Illumination maximum in foot-candles, daylight and artificial light.	Illumination minimum in foot-candles, daylight and artificial light.	Lights on during observations.	Floor.
		Feet.	*Feet.*	*Inches.*	*Sq. ft.*								*Feet.*										
24	1	25.0	3.2	33	79.3	C	2	AD	150-watt T 100-watt T	100.0	0	2	5.00	3.15	69	0.57	0.75	0.42	.....	.....	.....	0	6
26	1	7.7	3.2	38	24.3	TW	1	CLF	3.3-ft	0	0	1	0.50	0	0-12	8.6	16.2	1.1	.....	.....	.....	0	3
29b	1	8.0	4.0	34	32.0	C	1	AD	.....	0	0	0	3.83	0	45	1.2	1.7	0.75	.....	.....	.....	0	1
29b	2	8.0	4.0	34	32.0	C	.....								45	1.4	1.4	1.3	.....	.....	.....	0	1
31	1	10.0	3.0	34	30.0	C	0	.....	.....	.....	.....	.....	.....	0	.....	0.40	0.40	0.40	.....	.....	.....	0	3
31	2	7.8	3.0	35	23.5	C	1	AD	100-watt T	100	0	1	5.75	2.22	75	0.87	1.0	0.72	.....	.....	.....	0	3
31	3	6.8	3.2	34	21.4	C	.....								75	2.0	2.5	1.6	.....	.....	.....	0	3
32	1	5.3	2.4	31	12.9	TW	0	.....	.....	.....	.....	.....	.....	0	.....	0.60	0.65	0.55	.....	.....	.....	0	3
32	2	9.0	2.9	32	26.2	C	0	.....	.....	.....	.....	.....	.....	0	.....	1.7	1.9	1.5	.....	.....	.....	0	3
9b	1	14.3	5.5	39	78.6	C	3	CLD	100-watt T 60-watt T	100	S-11	1	3.00	2.80	44	.....	.....	.....	3.7	5.1	1.2	3	4
9b	2	28.7	5.5	39	158	C	1	CLD	60-watt T	100	0	1	3.00	0.38	44	.....	.....	.....	1.8	2.9	1.1	1	4
9b	3	11.1	3.4	39	37.7	TW	4	CLD	100-watt T	25	C-10	0	2.00	2.65	38	24.5	.....	.....	.....	.....	.....	0	4
9b	4	14.9	3.6	39	53.6	C	2	CLD	60-watt T	50	S-11	0	2.00	1.12	38	2.0	3.6	.38	.....	.....	.....	0	4
9b	5	14.9	3.6	39	53.6	C	2	CLD	60-watt T	100	0	2	2.00	2.23	38	.....	.....	.....	1.8	2.6	0.85	1	4

TABLE 4.—*Machine data.*

Shop No.	Number of machines.	Number of machines per bank.	Number of banks.	Height of machines.	Location of machines.	Arrangement of lights.	Total number of outlets.	Percentage of lamps that will light.	Size of lamps.	Type of lamp.	Watts per machine.	Cubic feet per hour per machine.	Type of reflector.	Number of bare lamps.	Height above machines. (1) See Remarks.	Angle of glare at needle.	Illumination average in foot-candles, daylight.	Illumination maximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight and artificial light.	Illumination maximum in foot-candles, daylight and artificial light.	Illumination minimum in foot-candles, daylight and artificial light.	Lights on during observation.	Floor.	Remarks.
				Inches																					
1...	10	10	1	30	⊥-W..	CLF..	3	100	13 cu. ft.	Gas arc......	....	3.9	0......	3	4.25	118	......	......	......	10.5	18.8	4.6	1	3	
2...	12	12	1	30	⊥-W..	CLF..	13	100	6 cu. ft.. 13 cu. ft.	Flat flame... Gas arc......	....	7.1	0......	13	4.75 1.25	67	9.2	31.9	1.8	......	......	......	0	5	4.75 feet to gas arc; 1.25 feet to flat flame.
3...	36	18	2	29.5	⊥-W..	AF....	3	100	...do....	.....do......	....	1.1	0......	3	4.67	91	12.3	80	0.75	......	......	......	0	6	
4...	20	12, 8	2	30	∥-W...	CLF..	3	100	...do....	.....do......	....	2.0	0......	3	4.67	121	37.2	70	13.1	......	......	......	0	4	
5...	14	14	1	30	∥-W...	CLF..	10	100	6 cu. ft..	Flat flame...	....	4.3	0......	10	0.83	55	24.9	36.0	21.0	......	......	......	0	3	
6...	16	16	1	31	∥-W...	CLF..	4	100	13 cu. ft.	Gas arc......	....	3.2	0......	4	4.83	122	1.9	5.7	0.91	......	......	......	0	4	
7...	26	12, 14	2	29.5	∥-⊥-W ⊥-W..	CLD..	3-4	33.3 25.0	100-watt.	Tungsten...	8.34 7.15	.....	0......	7	1.92	84	25.8	54.5	4.5	......	......	......	0	2	
8...	24	10, 14	2	30	∥-W...	CLD..	5-7	80 0	..do....	.....do......	40.0 0	.....	C-10...	0	0.67	50	20.0	53	5.1	......	......	......	0	3	
9a..	36	4	9	30	⊥-W..	DD...	36	47.2	50-watt.. 40-watt..	Gem...... Tantalum...	24.7	......	C-10...	12	1.10	25	44.2	110	10.0	......	......	......	0	4	1.36 to 0.25 feet. (1)
9b..	70	4, 8, 6	12	30	⊥-W..	DD... CLD..	47	76.5	100-watt. 60-watt.. 50-watt..	Gem........ Tungsten.... Gem........	30.9	......	C-10...	4	1.20	22 38	20.8	83	1.8	43.1	103	10.0	36	5	4 to 0.17 feet. (1)
9c..	16	4	4	30.5	⊥-W..	DF...	16	100	100-watt. 60-watt..	Tungsten...	62.5	......	C-10...	0	0.67	43	5.4	14.0	1.1	66.0	117	41	6	5	Light on all time.
10c.	24	6-6, 12	3	30	⊥-W..	CLD..	22	63.6	6 cu. ft..	Flat flame..	....	5.5	0......	22	0.50	46	43.2	117	13.5	......	......	......	0	12	
10c.	22	12-10	2	30	∥-W...	CLD..	22	68.2	...do....	.....do......	....	6.0	0......	22	0.50	46	41.2	62.5	17.0	......	......	......	0	12	
11b.	10	4-2	3	29.5	⊥-W..	DD...	10	90.0	80-watt.. 60-watt..	Gem........ Tungsten...	56.0	......	C-8....	0	2.30	34	50.4	135	12.6	......	......	......	0	3	6 to 3 feet. (1)
12..	18	18	1	29.5	∥-⊥-W.	CLF..	9	100	6 cu. ft..	Flat flame...	....	3.0	0......	9	1.42	72	11.4	35.5	3.8	......	......	......	0	5	
13..	16	16	1	29.5	∥-⊥-W.	CLD..	4	75	250-watt. 100-watt.	Tungsten...	28.1	......	0......	4	5.42	125	5.0	8.1	2.1	......	......	......	0	6	
14..	12	12	1	29.5	∥-⊥-W.	CLD..	4	50	..do.... 50-watt..	.....do...... Gem........	12.5	......	C-8....	0	3.20	108	5.0	13.5	0.30	......	......	......	0	4	
15..	12	12	1	30	∥-W...	DD...	12	100	...do....	.....do......	50.0	......	C-10...	0	2.00	105 30	2.2	5.9	0.52	16.5	40.1	4.9	12	5	3.33 to 0.42 feet. (1)
16..	14	14	1	30	∥-W...	CLD..	7	100	100-watt. 60-watt..	Tungsten...	47.0	......	C-8....	0	0.75	53	0.20	0.35	0.08	15.0	25.5	8.2	7	2	
16..	6	6	1	30	⊥-W..	CLD..	3	0	100-watt.	.....do......	0	......	C-8...	2	0.75	53	0.44	0.73	0.30	......	......	......	0	2	

TABLE 4.—*Machine data*—Continued.

Shop No.	Number of machines.	Number of machines per bank.	Number of banks.	Height of machines.	Location of machines.	Arrangement of lights.	Total number of outlets.	Percentage of lamps that will light.	Size of lamps.	Type of lamp.	Watts per machine.	Cubic feet per hour per machine.	Type of reflector.	Number of bare lamps.	Height above machines (1) See Remarks.	Angle of glare at needle.	Illumination average in foot-candles, daylight.	Illumination maximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight and artificial light.	Illumination maximum in foot-candles, daylight and artificial light.	Illumination minimum in foot-candles, daylight and artificial light.	Lights on during observation.	Floor.	Remarks.
				Inches																					
17..	10	10	1	30	‖-W...	DD...	10	10	50-watt..	Gem........	5.0	......	C-10...	0	3.00	115	5.8	7.2	5.0	......	......	......	0	4	4.5 to 2.42 feet.(1)
18..	16	16	1	31	‖-W...	DD...	16	31.2	60-watt.. 50-watt.. 35-watt..	Tungsten.... Gem........	16.5	......	C-10...	11	2.17	102	3.6	7.8	2.0	......	......	......	0	2	3.17 to 1.92 feet.(1)
19..	24	4	6	30	⊥-W..	DA...	24	37.5	50-watt..	.....do.......	18.7	......	½ tin..	0	0.33	26	81.1	140	42.2	......	......	......	0	8	
20..	20	20	1	29.5	‖-W...	CLD..	6	100	100-watt. 60-watt..	Tungsten...	28.0	......	0.....	6	2.00	65	3.2	6.0	1.4	......	......	......	0	3	1.17 to 2.17 feet.(1)
20..	16	16	1	29.5	‖-W...	CLD..	5	100	100-watt. 60-watt..	....do.......	23.8	......	0.....	5	2.00	65	0.32	0.45	0.09	6.2	19.0	2.0	5	3	Do.
21..	42	16–26	2	30	⊥-W..	CLD..	11	81.8	100-watt. 50-watt..	.....do....... Gem........	25	......	C-10...	0	2.50	97	2.5 .98	8.8 3.3	0.08 0.20	9.2 11.2	11.0 16.2	0.6 8.0	9	5	
22..	20	20	1	30	⊥-W..	CLD..	7	0	100-watt.	Tungsten....	0	......	C-10...	6	1.58	61	0.69	2.0	0.30	......	......	......	0	8	2.75 to 0.67 feet.(1)
22..	20	20	1	30	⊥-W..	CLD..	10	100	...do....	.....do.......	50.0	......	C-10...	0	1.58	61	1.2	4.1	0.44	20.3	34.0	10.5	10	8	
23..	14	14	1	30	‖-⊥-W.	DD...	12	100	60-watt.. 50-watt..	.....do....... Gem........	43.5	......	C-8....	0	3.00	46	11.4	27.5	4.5	......	......	......	0	3	3.75 to 0.75 feet.(1)
24..	30	12–6, 12	3	30	⊥-W..	CLD..	15	93.4	150-watt. 50-watt..	Tungsten.... Gem........	23.3	......	C-10.. C-12..	1	2.00	86	23.6 0.84 2.0	39.0 1.4 4.0	14.5 .55 .22	....	....	....	0 0 0	6 6 6	2.75 to 1.33 feet.(1) 150 - watt Tungsten base.
25b.	14	8–4,2	3	30	⊥-W..	DD...	14	93.0	...do....	.....do.......	46.5	......	C-10...	0	1.00	26	18.4	39.0	7.0	......	......	......	0	3	1.08 to 0.33 feet.(1)
25e.	16	16	1	29	‖-⊥-W.	CLF..	4	75.0	250-watt.	Tungsten....	46.8	......	D-18..	0	3.58	112	47.6	73.5	35.0	......	......	......	0	6	
25f.	16	16	1	30	⊥-‖-W.	CLF..	4	75.0	...do....	.....do.......	46.8	......	D-18..	0	3.42	110	30.1	50.0	15.2	......	......	......	0	7	
26..	7	2–1	4	29	⊥-W..	CLF..	2	10.0	3.3 cu. ft.	Reflex gas...	....	0.94	0.....	2	1.67	78	11.0	21.6	0.95	......	......	......	0	3	Opaline glass.
27..	10	10	1	30	⊥-‖-W.	CLF..	5	100	6 cu. ft..	Flat flame...	....	3.0	0.....	5	1.58	77	0.63	0.91	0.40	......	......	......	0	3	
28..	5	4–1	2	31	⊥-W..	CLD..	3	66.7	100-watt. 50-watt..	Tungsten.... Gem........	30.0	......	0.....	3	2.00	86	2.93	9.50	0.30	6.7	12.5	2.2	2	B	
29..	5	2–1, 2	3	30	⊥-W..	CLD..	3	100	100-watt. 50-watt..	Tungsten.... Gem........	50.0	......	C-8....	2	1.50	74	17.8	39.0	5.0	......	......	......	0	1	
30..	8	4	2	30	⊥-W..	CLD..	4	50	100-watt. 50-watt..	Tungsten.... Gem........	18.8	......	0.....	4	2.33	93	10.7	27.5	2.3	......	......	......	0	3	

31..	8	8	1	30	‖-W...	CLD..	4	100	100-watt.	Tungsten....	50.0	......	0.....	4	1.83	82	16.6	28.7	7.5	......	......	......	0	3
32..	12	4	3	30	⊥-W..	CLD..	6	50	..do.... 50-watt..	......do...... Gem........	20.8	......	D-12..	4	1.00	60	9.4	17.0	4.0	......	......	......	0	3
33a.	60	32-28	2	30	⊥-W..	CLF..	32	90	6 cu. ft..	Flat flame...	....	3.2	0.....	32	1.83	82	5.3	48.0	0.45	......	......	......	0	4
33b.	26	26	1	30	‖-W...	CLD..	10	57.1	50-watt..	Gem........	13.5	......	C-10...	0	1.42	72	7.3	27.0	1.2	......	......	......	0	5
34..	22	22	1	30	‖-W...	CLD..	6	66.6	100-watt. 50-watt..	Tungsten.... Gem........	9.22	......	C-8....	5	2.75	101	4.6	12.0	0.40	......	......	......	0	2
34..	16	16	1	30	‖-W...	....	0	0	....	....	0	0	0.....	0	......	......	34.7	51.5	18.2	......	......	......	0	2

TABLE No. 5.—*Finishing-table data.*

Shop No.	Number of tables.	Number of finishers.	Length.	Width.	Height.	Area.	Location.	Arrangement of lamps.	Number of outlets.	Per cent of lamps that will light.	Size of lamps.	Type of lamps.	Watts per square foot.	Cubic feet per hour per square foot.	Type of reflector.	Number bare lamps.	Height of reflector from table in feet.	Angle of glare.	Illumination average in foot-candles, daylight.	Illumination maximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight and artificial light.	Illumination maximum in foot-candles, daylight and artificial light.	Illumination minimum in foot-candles, daylight and artificial light.	Number of lamps on during observation.	Floor.	Remarks.
			Feet.	*Feet.*	*Ins.*	*Sq.ft.*																					
1...	1	8	5.75	0.92	34	5.28	⊥-W..	CLF..	2	100	6 cu. ft..	Flat flame.	.....	2.27	0.......	2	1.25	86	15.9	20.5	12.2	.....	.....	.....	0	3	
2...	1	3	4.00	1.17	31	4.68	⊥-W..	CLF..	1	100	13 cu. ft.	Gas arc...	.....	2.78	0.......	1	3.75	101	56.0	74.0	38.0	.....	.....	.....	0	5	
3...	1	7	5.92	1.00	30	5.92	C......	....	0	.....	....	....	0	0	....	0	.....	.....	8.0	11.3	4.6	.....	.....	.....	0	6	
4...	1	2	6.00	1.00	30	6	C......	....	0	.....	....	....	0	0	....	0	.....	.....	3.2	3.9	2.6	.....	.....	.....	0	4	
5...	1	1	5.58	2.42	28	13.5	C......	CLF..	1	100	6 cu. ft..	Flat flame.	.....	0.444	0.......	1	0.17	38	2.5	2.5	2.5	.....	.....	.....	0	3	
6...	2	2	5.00	0.92	32	9.2	C......	AF...	1	100	13 cu. ft.	Gas arc...	.....	1.41	0.......	1	4.83	114	.....	.....	.....	6.3	6.4	6.2	1	4	
7...	2	3	5.58	1.42	57	15.9	‖-W ..	CLD..	1	100	100-watt	Tungsten .	6.3	.....	0.......	1	1.25	116	61.1	102	20.2	.....	.....	.....	0	2	
8...	12	48	8.00	1.08	31	104	4-⊥-W 8-C...	CLD..	24	58.4	...do.....	...do.......	13.5	.....	M-40.. C-10..	0	3.25	117	6.0	15.7	2.5	.....	.....	.....	0	3	
9a..	9	36	6.60	1.00	32	59.4	C......	CLD..	9	55.5	100-watt 60-watt..	...do.....	6.4	.....	C-10..	6	2.0	101	5.6	11.5	1.1	.....	.....	.....	0	4	
9b..	4	32	13.70	1.00	33	54.8	C......	CLD..	8	100	60-watt..	...do.......	8.75	.....	C-10..	0	1.92	101	4.9	12.0	1.1	.....	.....	.....	0	5	
9b..	4	32	13.70	1.00	32	54.8	C......	CLD..	8	100	...do.....	...do.......	8.75	.....	C-10.. S-11...	0	1.92	101	.....	.....	.....	7.08	12.0	3.4	6	5	
9b..	6	24	6.80	1.00	33	40.8	C......	CLD..	5	100	100-watt 60-watt .	..do.......	11.2	.....	C-10..	1	1.92	101	1.6	2.4	0.55	.....	.....	.....	0	5	
9c..	6	48	12.00	1.08	30½	77.8	5-⊥W. 1-C...	CLF..	18	83.4	100-watt 60-watt.. 50-watt..	...do..... ...do..... Gem.....	12.5	.....	C-10..	0	1.42	73	1.4	4.8	0.25	28.3	78.6	6.5	15	5	
10c.	6	22	6, 12, 18, 24	1.00	33	78	2-⊥W. 4-C...	CLF..	22	100	6 cu. ft..	Flat flame.	.....	1.69	0.......	22	0.33	50	5.8	14.0	2.4	.....	.....	.....	0	12	
11b	5	28	5.17 10.33	1.00	34	36.2	1-⊥W. 4-C...	CLD..	14	93	100-watt 60-watt.. 50-watt..	Tungsten ...do ..... Gem.....	23.4	.....	C-8...	0	1.71	84	52.0	80.0	26.0	.....	.....	.....	0	3	Maximum, 3.5 feet; minimum, 0.75 foot.
12..	5	18	6.00	1.00	32	30	1-⊥W. 4-C...	CLF..	7	100	6 cu. ft.. 13 cu. ft.	Flat flame Gas arc..	.....	1.63	0.......	7	1.17	78	1.7	4.4	0.60	.....	.....	.....	0	5	

13..	3	12	7.58 4.92 4.50	1.00	31 32 29	15.0	C.....	AD...	1	0	....	O.........	.....	.....	M-40..	0	5.58	100	1.5	1.9	1.0	.....	.....	.....	0	6	
14..	3	8	7.25	1.00	32	21.8	⊥-W..	CLD..	2	100	100-watt 40-watt..	Tungsten .	6.42	.....	C-8...	0	3.42	121	8.1	19.5	5.0	.....	.....	.....	0	4	
15..	2	12	7.00	1.00	31	14	⊥‖-W..	CLD..	3	100	100-watt	...do......	21.4	.....	M-40..	0	4.5	100	9.7	17.3	2.6	.....	.....	.....	0	5	
16..	3	25	17.42 15.58 10.25	1.00	29	43.2	C.....	CLD..	8	87.5	60-watt.. 40-watt..	..do......	8.33	.....	C-8...	1	1.17	69	5.8	16.0	0.25	.....	.....	.....	0	2	
17..	3	10	10.00 5.00	1.00	33	25	C.....	....	0	.....	....	O.........	.....	.....	....	....	.....	.....	55.2	182	2.8	.....	.....	.....	0	4	
18..	2	6	6.20	2.00	33	24.8	C.....	AD...	2	100	60-watt..	Tungsten .	4.84	.....	C-10.. D-10..	0	7	130	0.23	0.35	0.16	4.2	9.3	1.2	0	2	
19..	8	28	4.00	1.00	32	32	3-⊥W. 5-C...	CLD..	8	100	100-watt 60-watt..	..do......	21.2	.....	F-9...	0	7	136	17.4	68.0	4.6	.....	.....	.....	0	8	
20..	2	12	7.67	2.83	34	43.5	⊥-W..	CLD..	3	100	100-watt 60-watt..	..do......	5.97	.....	0......	3	2.83	103	2.2	2.8	1.3	8.0	10.7	5.2	3	3	Paper shades.
21..	1	4	6.75	3.17	32	21.4	C.....	AD...	1	100	100-watt.	...do......	4.66	.....	0......	1	4.83	108	2.9	3.4	2.4	.....	.....	.....	0	5	
22..	2	12	6.17	1.67	29	20.6	⊥-W..	AD...	2	50	...do....	...do......	4.85	.....	C-10..	1	3.58	94	4.6	11.0	0.92	.....	.....	.....	0	8	
23..	5	20	9.17 4.58	1.00	33	36.7	1-‖-W. 4-C...	CLD..	8	100	100-watt 60-watt.. 50-watt..	...do..... ...do..... Gem.....	15	.....	C-10..	1	1.7	96	2.8	3.3	1.8	.....	.....	.....	0	3	Maximum, 4 ft.; minimum, 0.25 foot.
24..	1	10	5.00	1.00	33	5	‖-W ..	CLD..	1	100	150-watt	Tungsten .	30	.....	C-10..	0	3	117	6.2	6.2	6.2	.....	.....	.....	0	6	
25b	5	12	6.00	1.00	33	30	2-⊥-W 1-‖-W. 3-C...	CLD..	3	100	250-watt	...do......	25	.....	D-18..	0	2.67	113	14.0	56.2	1.3	.....	.....	.....	0	3	
25e.	5	30	10.50 5.17	1.00	33	36.5	3-⊥W. 2-‖-W.	CLD..	4	100	...do....	...do......	27.4	.....	D-18..	0	3.83	113	53.8	89.8	10.7	.....	.....	.....	0	6	
25f	6	30	10.00 4.58	1.00	33	49.2	2-‖-W. 3-⊥-W 1-C...	CLD..	4	50	...do....	...do......	10.2	.....	D-18..	0	3.67	124	75.0	130	24.2	.....	.....	.....	0	7	
26..	3	12	3.00	1.00	33	9	1-⊥-W 2-C...	AD... CLD..	2	50	3.3 cu.ft.	Reflex....	.....	0.367	0......	2	1.67	83	7.2	7.2	7.2	.....	.....	.....	0	3	
27..	1	2	3.50	1.00	31	3.5	C.....	....	0	....	....	....	.....	0	....	....	.....	.....	0.75	1.5	0.50	.....	.....	.....	0	3	
29b	2	4	4.75	1.00	32	9.5	C.....	CLD..	1	100	100-watt	Tungsten .	10.5	.....	C-8...	0	1.1	75	6.8	9.5	5.0	.....	.....	.....	0	1	
30..	1	7	4.17	1.00	34	4.2	⊥-W..	AD...	1	100	...do....	...do......	23.8	.....	M-60..	0	4	97	47.3	48.0	46.6	.....	.....	.....	0	3	
31..	2	6	4.10 5.17	1.00 1.33	30 22	11	⊥-W..	CLD..	2	100	...do....	...do......	18.2	.....	0......	2	1.2 3.4	73 108	8.8	12.5	5.0	.....	.....	.....	0	3	
32..	1	6	9.42	1.00	31	9.4	⊥-W..	CLD..	1	100	...do....	...do......	10.6	.....	0......	1	1.8	94	3.5	5.6	3.3	.....	.....	.....	0	3	
33a.	2	12	12.00	4.20	29	101	⊥-W..	CLF..	8	100	6 cu. ft..	Flat flame	.....	0.474	0......	8	4.2	103	17.1	39.2	6.2	.....	.....	.....	0	4	
34..	1	4	5.25	2.83	32	14.9	‖-W ..	AD...	1	100	50-watt..	Gem......	3.4	.....	0......	1	2.17	91	.....	.....	.....	3.4	4.9	1.8	1	2	
34..	1	3	3.00	1.00	32	3	⊥-W..	CLD..	1	0	....	....	0	0	0......	0	4	125	3.6	3.6	3.6	.....	.....	.....	0	2	

TABLE 6.—*Pressing-table data.*

Shop No.	Number of tables.	Location.	Length.	Width.	Height of tables.	Height to boards.	Table area.	Number of boards.	Area of boards.	Ratio of area of table to area of boards.	Number of outlets.	Per cent of lamps that will light.	Number of bare lamps.	Size of lamps.	Type of lamps.	Watts per square foot of table.	Watts per square foot of boards.	Cubic feet per hour per square foot of table.	Cubic feet per hour per square foot of boards.	Location of lamps.	Type of reflectors.	Height to lamps above boards.	Angle of glare.	Illumination average in foot-candles, daylight.	Illumination maximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight and artificial light.	Illumination maximum in foot-candles, daylight and artificial light.	Illumination minimum in foot-candles, daylight and artificial light.	Lights on during observation.	Floor.	Remarks.
			Ft.	*Ft.*	*In.*	*In.*	*S.ft.*		*S.ft.*																							
1...	1	C....	7.8	6.1	28	37	47.6	3	7.7	6.16	1	100	1	13-cu. ft.	Gas-arc...	....	.....	0.273	1.68	CLF.	0....	4.43	102	2.3	3.2	1.5	....	....	....	0	3	
2...	1	C....	11.8	6.1	28	37	72.8	4	10.3	6.96	1	100	1	...do....	...do......	....	.....	0.180	1.26	CLF.	0....	4.75	100	9.8	19.9	4.0	....	....	....	0	5	Pressing on flat table top.
3...	1	⊥-W.	10.0	3.0	28	28	30.0	...	30.0	1.00	2	100	2	6-cu. ft..	Flat-flame.	....	.....	0.400	0.40	CLF.	0....	3.00	52	32.6	41.7	15.2	....	....	....	0	6	
4...	1	C....	12.2	5.7	28	37	69.4	3	7.7	8.96	4	100	4	...do....	...do......	....	.....	0.346	3.30	CLF.	0....	2.50	72	3.9	5.0	3.0	....	....	....	0	4	
5...	1	C....	12.2	6.1	23	32	74.4	3	7.7	9.62	2	100	2	...do....	...do......	....	.....	0.162	1.55	CLF.	0....	4.00	94	4.3	11.2	0.65	....	....	....	0	3	
6...	1	C....	11.7	6.3	29	38	74.0	2	5.2	14.31	1	100	1	13-cu. ft.	Gas arc...	....	.....	0.176	2.52	CLF.	0....	4.34	100	0.61	0.91	0.26	....	....	....	0	4	
7...	1	⊥-W.	11.2	5.6	28	37	63.0	4	10.3	6.05	2	100	2	100-watt.	Tungsten .	3.2	19.4	.....	.....	CLD.	0....	1.25	47	33.2	38.5	13.5	....	....	....	0	2	
8...	2	C....	16.6	5.6	26	35	185.1	12	31.0	5.99	5	100	0	...do....	...do......	2.7	16.1	....	.....	CLD.	M-40	2.79	76	.....	.....	.....	1.2	2.6	0.31	3	3	
9a..	1	⊥-W.	17.0	5.0	24	33	85.0	6	15.5	5.48	3	100	1	100-watt. 60-watt..	..do......	3.1	16.8	.....	.....	CLD.	S-11	2.50	38	.....	.....	.....	3.5	6.2	1.8	3	4	
9b..	4	C....	11.2	5.1	30	38	227.1	16	41.3	5.50	8	100	1	100-watt. 60-watt..	..do......	2.3	12.1	.....	.....	CLD.	S-11 C-10 C-17	3.58	95	.....	.....	.....	5.7	9.5	1.6	8	5	
9c..	2	C....	13.3	5.9	30	38	157.1	8	20.6	7.60	3	100	1	100-watt.	...do......	1.9	14.6	.....	.....	CLD.	S-11 D-14	3.20	85	.....	.....	.....	4.6	7.5	1.9	3	5	
10c.	2	C....	33.5	5.6	27	36	374.0	24	62.0	6.04	6	83	0	...do....	...do......	1.3	8.1	.....	.....	CLD.	M-40	5.17	112	4.6	12.5	0.65	....	....	....	0	12	
11b.	3	⊥-W.	11.8	6.0	31	40	212.0	12	31.0	6.85	6	83	0	250-watt.	...do......	5.9	40.3	.....	.....	CLF.	0B ..	3.44	79	.....	.....	.....	7.0	15.2	1.2	5	3	Maximum, 4 feet; minimum, 2.83 ft.
12..	1	⊥-W.	18.0	5.2	27	36	94.5	7	18.1	5.22	6	100	6	6-cu. ft..	Flat-flame.	....	.....	0.381	1.99	CLF.	0....	2.25	66	6.1	20.5	0.65	....	....	....	0	5	
13..	1	‖-W..	17.7	4.2	29	38	75.1	5	12.9	5.82	3	66	3	250-watt.	Tungsten .	6.7	38.8	.....	.....	CLD.	0....	4.67	115	4.1	5.6	1.1	....	....	....	0	6	
14..	1	C....	14.0	6.0	29	38	84.0	4	10.3	8.14	1	100	1	100-watt.	...do......	1.2	9.7	.....	.....	CLD.	0....	4.67	106	1.4	1.9	1.0	....	....	....	0	4	
15..	1	C....	12.8	5.8	26	35	74.9	4	10.3	7.20	2	100	0	...do....	...do......	2.7	19.4	.....	.....	CLD.	M-40	2.25	66	5.4	6.8	4.5	....	....	....	0	5	
16..	1	C....	24.0	62.5	28	38	150.0	8	20.6	7.30	3	100	0	...do....	...do......	2.0	14.6	.....	.....	CLD.	M-60	4.42	101	.....	.....	.....	2.6	3.4	1.3	3	2	
17..	1	C....	10.0	11.0	30	38	110.0	4	10.3	10.70	2	100	0	...do....	...do......	1.8	19.4	.....	.....	CLD.	C-10	3.00	74	17.8	19.0	16.5	....	....	....	0	4	
18..	1	C....	20.6	4.8	26	34	99.0	8	20.6	4.80	3	100	0	60-watt..	...do......	1.8	8.7	.....	.....	CLD.	C-10	5.00	115	0.32	0.67	0.11	2.4	4.2	1.1	3	2	

19..	1	⊥-W.	42.0	6.0	27	36	252	16	41.3	6.1	6	83	0	100-watt.	Tungsten.	1.6	10.1	.....	.....	CLD.	F-9.	7.00	124	6.5	34.0	0.50	....	....	....	0	8	
20..	1	C.....	11.2	5.2	29	38	57.7	4	10.3	5.6	2	100	2	60-watt.. 100-watt.	..do.....	2.8	15.5	.....	.....	CLD.	0....	3.75	97	0.36	0.50	0.24	4.8	7.2	3.5	2	3	
21..	1	‖-W .	10.0	3.9	36	36	39.2	...	39.2	1.0	2	100	0	100-watt.	...do.....	5.1	5.1	.....	.....	CLD.	10-C	3.00	51	42.2	55.0	30.0	....	....	....	0	5	Pressing on flat table top.
22..	1	‖-W..	7.7	4.8	32	41	36.4	4	10.3	3.6	2	100	2	...do....	...do.....	5.5	19.4	.....	.....	CLD.	0....	3.00	88	3.1	8.6	0.50	....	....	....	0	8	
23..	1	‖-W..	21.0	5.2	27	36	109.0	6	15.5	7.0	4	100	0	100-watt. 60-watt..	..do.....	3.3	23.2	.....	.....	CLD.	M-60	2.83	79	0.78	1.3	0.40	....	....	....	0	3	
24..	1	⊥-W.	8.8	6.3	29	38	54.7	3	7.7	7.1	1	100	0	150-watt.	...do.....	2.7	19.5	.....	.....	CLD.	C-10	2.33	69	7.4	10.6	4.2	....	....	....	0	6	
25b.	1	C.....	7.7	7.0	27	36	53.7	4	10.3	5.2	1	100	0	250-watt.	...do.....	4.6	24.3	.....	.....	CLF.	D-18	3.33	83	.....	......	.....	2.9	3.4	2.6	1	3	
25e.	1	‖-W..	29.2	5.5	27	36	160.0	8	20.6	7.8	2	100	0	...do....	...do.....	3.1	24.2	.....	.....	CLF.	D-18	3.00	81	7.1	12.2	4.0	....	....	....	0	6	
25f..	1	C.....	30.5	6.3	27	36	19110	8	20.6	9.3	2	100	0	...do....	...do.....	2.6	24.3	.....	.....	CLF.	D-18	3.00	80	48.5	150.0	8.5	....	....	....	0	7	Skylight over table.
26..	1	C.....	5.8	5.8	29	38	33.0	4	10.3	3.2	1	0	1	13.3-cu.ft.	Reflex....	....	.....	.....	.....	CLF.	0....	2.33	69	44.0	71.5	16.5	....	....	....	0	3	
27..	1	C.....	10.0	2.8	27	36	27.5	2	5.2	5.3	1	100	1	6-cu. ft..	Flat-flame.	....	.....	0.218	1.15	CLF.	0....	3.00	115	.....	......	.....	0.60	0.90	0.30	1	3	
29b.	1	C.....	7.6	5.4	29	38	41.1	3	7.7	5.3	1	100	0	100-watt.	Tungsten.	2.4	13.0	.....	.....	CLD.	C-8..	1.75	57	0.65	0.70	0.55	4.8	6.5	2.4	1	1	
30..	1	⊥-W.	6.5	5.7	27	36	36.8	2	5.2	7.1	1	0	0	....	....	0	0	.....	.....	CLD.	0....	3.33	87	12.0	17.0	6.9	....	....	....	0	3	
31..	1	‖-W..	5.8	8.2	27	36	47.0	2	5.2	9.0	1	100	1	100-watt.	Tungsten.	2.1	19.2	.....	.....	AD..	0....	3.25	72	19.7	24.5	4.8	....	....	....	0	3	
32..	1	C.....	14.0	5.8	26	37	81.7	4	10.3	7.9	2	100	0	...do....	...do.....	2.4	19.4	.....	.....	CLD.	D-12	4.6	102	0.22	0.45	0.11	....	....	....	0	3	
33a.	2	⊥-W.	19.0	5.3	35	44	203.0	12	31.0	6.5	4	100	4	6-cu. ft..	Flat-flame	....	.....	0.118	0.774	CLF.	0....	2.6	78	37.6	82.7	5.2	....	....	....	0	4	
34..	1	‖-W..	15.0	6.0	25	34	90.0	4	10.3	8.8	2	50	1	50-watt..	Gem.....	0.56	4.85	.....	.....	CLD.	F-9.	4.5	103	1.2	3.2	0.25	....	....	....	0	2	
34..	1	C.....	4.0	3.0	25	34	12.0	1	2.58	4.7	1	100	0	...do....	...do.....	4.12	10.1	.....	.....	CLD.	C-8.	2.5	72	0.70	0.70	0.70	2.4	2.4	2.4	1	2	

TABLE 7.—*Machine data, buttonhole.*

Shop No.	Number of machines.	Number of machines per bank.	Number of banks.	Height of machines.	Location of machines.	Arrangement of lamps.	Number of outlets.	Per cent of lamps that will light.	Size of lamps.	Type of lamps.	Watts per machine.	Cubic feet per hour per machine.	Type of reflector.	Number of bare lamps.	Height above machines.	Angle of glare at needle.	Illumination average in foot-candles, daylight.	Illumination maximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight and artificial light.	Illumination maximum in foot-candles, daylight and artificial light.	Illumination minimum in foot-candles, daylight and artificial light.	Lights on during observations.	Floor.
				In.											*Feet.*									
7	1	1	1	34	‖-w.	AD.	1	100	100-watt.	Tungsten.	100	...	0.	1	5.9	101	16.2	...	...	...	...	...	...	2
8	1	1	1	34	⊥-w.	D.	1	100	100-watt.	do.	100	...	M-60.	0	3.2	129	5.2	...	...	...	...	...	...	3
9a	1	1	1	34	C.	D.	2	100	50-watt. 100-watt.	Gem. Tungsten.	150	...	C-10.	1	1.7	88	1.9	...	...	7.0	...	...	2	4
11b	1	1	1	34	⊥-w.	D.	2	50	60-watt.	do.	60	...	C-8.	0	2.8	144	0.60	...	...	4.4	...	...	2	3
12	1	1	1	34	‖-w.	F.	1	100	6 cu. ft.	Flat flame.	...	6	0.	1	2.0	150	2.2	...	...	3.4	...	...	1	5
13	1	1	1	34	‖-w.	...	...	...	...	...	...	...	...	...	...	...	1.6	...	...	...	...	...	...	6
14	1	1	1	34	‖-w.	D.	1	100	50-watt.	Gem.	50	...	C-8.	0	3.25	102	2.0	...	...	...	...	...	...	4
16	1	1	1	34	C.	...	...	...	...	...	...	...	...	...	...	...	1.3	...	...	...	...	...	...	2
17	1	1	1	34	‖-w.	...	...	...	...	...	...	...	...	...	...	...	16.0	...	...	...	...	...	...	4
18	1	1	1	34	⊥-w.	...	...	...	...	...	...	...	...	...	...	...	1.8	...	...	...	...	...	...	2
19	1	1	1	34	⊥-w.	...	...	...	...	...	...	...	...	...	...	...	16.6	...	...	...	...	...	...	
23	1	1	1	34	C.	D.	1	100	60-watt.	Tungsten.	60	...	C-8.	0	2.9	130	0.55	...	...	...	...	...	...	8
25	2	2	1	34	⊥-w.	D.	1	100	100-watt.	do.	50	...	0.	1	4.0	97	17.0	23.7	10.4	...	...	...	...	3
28	5	1, 4	2	31	⊥-w.	CLD.	3	66.7	100 T. 50 G.	do. Gem.	30	...	0.	3	2.0	86	2.9	9.5	.30	6.7	12.5	2.2	2	[1] B.
31	1	1	1	35	C.	...	...	...	...	...	...	...	...	...	...	...	1.4	...	...	...	...	...	...	3

[1] Daylight taken in court at back.

TABLE 8.—*Cutting-table data, design room.*

Shop No.	Table No.	Length.	Width.	Height.	Area.	Location of tables.	Number of outlets for lamps.	Size of lamps.	Type of lamps.	Per cent of lamps that will light.	Type of reflectors.	Number of bare lamps.	Height above table.	Watts per square foot.	Angle of glare.	Angle of glare, minimum.	Illumination average in foot-candles, daylight.	Illumination maximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight and artificial light.	Illumination maximum in foot-candles, daylight and artificial light.	Illumination minimum in foot-candles, daylight and artificial light.	Lights on during observations.	Floor.
		Feet.	*Feet.*	*In.*	*Sq.-ft.*								*Feet.*											
8	1	11.7	3.2	32	37.4	⊥-w	1	100-watt	Tungsten	0	XE-60	0	[1] 6.0	0	230	......	7.3	13.6	1.1	......	......	......	0	3
9b	1	11.0	2.5	32	27.5	⊥-w	1	60-watt	do	100	S-11	0	2.0	2.18	21	......	84.0	......	......	......	......	......	0	5
9b	2	9.0	2.5	32	22.5	‖-w	1	do	do	100	0	1	2.1	2.67	21	......	66.2	......	......	......	......	......	0	5
9b	3	11.0	2.5	32	27.5	⊥-w	1	100-watt	do	100	C-10	0	2.0	3.63	21	......	70.0	......	......	......	......	......	0	5
10b	1	6.9	3.1	34	21.4	⊥-w	1	do	do	100	E-9	0	5.4	4.66	100	......	4.8	7.0	2.6	......	......	......	0	11
10b	1	8.2	3.2	36	26.8	⊥-w	1	do	do	100	E-9	0	5.0	3.73	94	......	30.0	52.5	7.6	......	......	......	0	11
11a	1	9.0	3.5	36	31.5	‖-w	1	150-watt	do	100	C-10	0	3.1	4.30	56	......	3.8	......	......	......	......	......	0	2
11b	1	4.0	2.0	34	8.0	⊥-w	2	60-watt	do	100	C-8	0	3.0	15	80	......	2.2	......	......	......	......	......	0	3
11b	1	8.0	2.0	34	16.0	‖-w	0	......	......	......	......	......	......	0	......	......	4.2	......	......	......	......	......	0	3
16	1	7.5	3.7	34	27.5	⊥-w	0	......	......	......	......	......	......	0	......	......	18.0	......	......	......	......	......	0	2
18	1	5.5	3.0	34	16.5	‖-w	1	60-watt	Tungsten	100	E-9	0	3.0	3.64	36	......	65.0	......	......	......	......	......	0	2
19	1	4.0	3.0	34	12.0	‖-w	0	......	......	......	......	......	......	......	......	......	3.0	4.4	2.7	......	......	......	0	8
21	1	7.0	3.2	34	22.7	⊥-w	0	......	......	......	......	......	......	......	......	......	3.8	......	......	......	......	......	0	6

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[1] Horizontal distance, 4 feet.

TABLE 9.—*Machine data, design room.*

Shop No.	Number of machines.	Number of machines per bank.	Number of banks.	Height of machines.	Location of machines.	Arrangement of lamps.	Number of outlets.	Per cent of lamps that will light.	Size of lamps.	Type of lamps.	Watts per machine.	Cubic feet per hour per machine.	Type of reflector.	Number of bare lamps.	Height above machines.	Angle of glare at needle.	Illumination average in foot-candles, daylight.	Illumination maximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight and artificial light.	Illumination maximum in foot-candles, daylight and artificial light.	Illumination minimum in foot-candles, daylight and artificial light.	Lights on during observations.	Floor.
				In.																				
8	3	3	1	30	⊥-w	CLD	1	100	100-watt	Tungsten	33.3	......	E60	0	2.5	80	31.4	46.6	16.3	......	......	......	0	3
9b	6	6	1	30	⊥-w	DD	4	75	2 60-watt 1 100-watt	do	36.7	......	C-10	0	2.2	82	14.2	23.0	5.4	......	......	......	0	5
9b	4	4	1	30	⊥-w	CLD	2	100	60-watt	do	30.0	......	C-10	0	2.2	91	63.3	105	21.2	......	......	......	0	5
10b	5	5	1	29	⊥-w	CLD	1	100	100-watt	do	20.0	......	E9	0	5.0	132	35.3	85.0	8.4	......	......	......	0	11
10b	6	2, 4	2	29	⊥-w	CLD	2	100	100-watt	do	33.3	......	E9	0	3.3	120	48.3	110	5.9	......	......	......	0	11
11a	4	2	2	29	⊥-w	DD	4	100	2 250-watt 2 100-watt	do	175	......	C-10	0	2.3	98	195	......	......	......	......	......	0	2
11b	2	2	1	29	⊥-w	CLD	1	100	60-watt	do	30	......	C-8	0	3.0	110	11.5	......	......	......	......	......	0	3
11b	6	4, 2	2	29	⊥-w	DD	5	100	60-watt	do	50	......	C-8	0	3.0	91	52.1	95.0	7.6	......	......	......	0	3
16	3	2, 1	2	29	⊥-w	CLD	2	0	......	......	0	......	C-10	1	1.0	......	60.5	103	32.0	......	......	......	0	2
18	2	1	2	29	⊥-w	......	......	......	......	......		......	......	......	......	......	97.5	160	35.0	......	......	......	0	2
19	1	1	1	29	⊥-w	CLD	1	100	100-watt	Tungsten	100	......	F-9	0	2.0	97	87.5	......	......	......	......	......	0	8
19	6	6	1	29	⊥-w	DD	6	100	50-watt	Gem	50	......	½ tin	0	0.5	51	32.8	54.0	5.5	......	......	......	0	8
19	6	6	1	29	⊥-w	CLD	3	100	50-watt	do	25	......	C-10	0	1.5	74	33.8	52.6	6.8	......	......	......	0	8
24	2	2	1	30	⊥-w	CLD	1	100	50-watt	do	25	......	D-12	0	2.1	100	6.1	10.4	1.8	......	......	......	0	6

TABLE No. 10.—*Finishing-table data, design room.*

Shop No.	Number of tables.	Number of finishers.	Length.	Width.	Height.	Area.	Location.	Arrangement of lamps.	Number of outlets.	Per cent of lamps that will light.	Size of lamps.	Type of lamps.	Watts per square foot.	Cubic feet per hour per square foot.	Type of reflector.	Number of bare lamps.	Height of reflector from table in feet.	Angle of glare.	Average illumination in foot-candles, daylight.	Maximum illumination in foot-candles, daylight.	Minimum illumination in foot-candles, daylight.	Average illumination in foot-candles, daylight and artificial light.	Maximum illumination in foot-candles, daylight and artificial light.	Minimum illumination in foot-candles, daylight and artificial light.	Number of lamps on during observation.	Floor.
			Feet.	*Feet.*	*In.*	*Sq. ft.*																				
9b	1	1	3.0	1.0	32	3	‖-w	....	0	......	....	....	0	0	....	......	......	......	10.3	....	....	......	....	....	0	5
11a	1	1	2.0	1.0	32	2	‖-w	AD	1	100	150-watt	Tungsten	75	......	C-10	0	2.5	93	57.5	....	....	......	....	....	0	2
11b	1	1	2.0	1.0	32	2	‖-w	CLD	1	100	60-watt	do	......	......	C-10	0	1.5	66	1.0	....	....	25.0	....	....	1	3
11b	1	1	2.0	1.0	32	2	‖-w	CLD	1	100	150-watt	do	......	......	0	1	1.1	52	12.0	....	....	......	....	....	0	3
18	1	1	4.2	1.2	34	4.9	⊥-w	....	......	......	....	....	......	......	....	......	......	......	55.0	....	....	......	....	....	0	2
24	1	1	3.0	2.5	30	7.5	‖-w	....	......	......	....	....	......	......	....	......	......	......	12.0	....	....	......	....	....	0	6

TABLE NO. 11.—*Pressing-table data, design room.*

Shop No.	Number of tables.	Location.	Length.	Width.	Height of table.	Height to boards.	Table area.	Number of boards.	Area of boards.	Ratio of area of table to area of boards.	Number of outlets.	Per cent of lamps that will light.	Number of bare lamps.	Size of lamps.	Type of lamps.	Watts per square foot of table.	Watts per square foot of boards.	Cubic feet per hour per square foot of table.	Cubic feet per hour per square foot of boards.	Location of lamps.	Type of reflectors.	Height to lamp above boards.	Angle of glare.	Illuminating average in foot-candles daylight.	Illuminating maximum in foot-candles daylight.	Illuminating minimum in foot-candles daylight.	Illuminating average in foot-candles daylight and artificial light.	Illuminating maximum in foot-candles daylight and artificial light.	Illuminating minimum in foot-candles daylight and artificial light.	Lights on during observation.	Floor.
			Ft.	*Ft.*	*In.*	*In.*	*Sq. ft.*		*Sq. ft.*																						
9b....	1	⊥-w..	5.0	2.5	30	39	12.5	1	2.58	4.85	1	100	1	60 watt....	Tu....	4.8	23.2	....	....	Wall....	0	1.0	17	6.5	....	....	....	....	....	0	5
9b....	1	⊥-w..	6.0	3.0	30	39	18.0	1	2.58	6.99	1	100	0	60 watt....	Tu....	3.3	23.2	....	....	Wall....	C-10..	1.0	15	9.6	....	....	....	....	....	0	5
10b...	1	‖-w...	6.0	2.0	30	39	12.0	1	2.58	4.65	1	100	1	50 watt...	Gem..	2.4	19.4	....	....	D. Horz. 14″	0	1.0	39	1.2	....	....	4.0	....	....	....	11
11a...	1	‖-w...	3.0	1.0	30	39	3.0	1	2.58	1.16	1	100	0	150 watt...	Tu....	50	58.2	....	....	LCD....	C-10..	2.5	108	17.0	....	....	....	....	....	0	2
19....	1	⊥-w..	3.0	2.0	30	39	6.0	2	5.16	1.16	1	100	0	100 watt...	Tu....	16.6	19.4	....	....	LCD....	F-9...	2.0	63	9.8	13.8	5.7	....	....	....	0	[illegible]
19....	1	‖-w...	4.0	2.0	30	39	8.0	2	5.16	......	0	....	....	....	....	....	....	....	....	....	....	....	....	1.7	2.2	1.2	....	....	....	0	8

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[1] Horizontal distance, 14 feet.

TABLE 12.—*Illumination on stairs.*

Shop No.	Windows.				Color.			Number of outlets.	Per cent that will light.	Size of lamps.	Type of lamps.	Type of reflector.	Number of bare lamps.	Location of lamps.	Height above floor.	Illumination average in foot-candles, daylight.	Illumination maximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight, and artificial light.	Illumination maximum in foot-candles, daylight, and artificial light.	Illumination minimum in foot-candles, daylight, and artificial light.	Lights on during observation.	Floor.	Remarks.
	N.	S.	E.	W.	Walls.	Ceilings.	Stairs.																	
1	0	0	0	0	Br	Br	Bl	1	100	6 cu. ft.	Flat-flame.	0	1	Landing	5.0	0.042			0.12			1	3	
2	0	0	0	1	Br	Br	Bl	0								5.6	8.7	2.6					5	
3		1	0	0	W	W	Bl	0								47.5	59.0	36.0					6	
4		1	0	0	W	W	Bl	0								51.0							4	
5	0	0	0	0	Rd	Rd	Bl	1	*100	6 cu. ft.	Flat-flame.	0	1	Landing	5.0	0.003	0.003	0.003	0.011	0.022	0.003	1	3	Tip in very poor condition.
6	0	0	0	0	Rd	Rd	Bl	1	100	do	do	0	1	do	5.0	0.005	0.006	0.004				0	4	
7	0	0	0	0	W	W	Bl	1	100	50-watt	Gem	0	1	do	7.0				0.152	0.214	0.090	1	2	
8	0	0	0	0	Br	Br	Bl	1	100	do	do	0	1	do	6.0				0.032			1	3	
8	0	0	0	0	Br	Br	Bl	1	100	6 cu. ft.	Flat-flame.	0	1	do	6.0				0.016			1	3	
8	0	0	0	0	Bl	W	Bl	1	100	50-watt	Gem	0	1	do	6.0				0.039			1	3	
9a	0	0	0	0	Bl	Bf	Bl	2	100	30-watt 50-watt	do	0	2	Landing turn.	6.0				0.040			2	4	
9b	0	0	0	0	Bl	Bf	Bl	2	100	30-watt	do	(1)	0	do	6.0				0.012	0.013	0.010	2	5	
9c	0	0	0	0	Bl	W	Bl	1	100	50-watt	do	0	1	Landing	6.0				0.06			1	5	
9c	0	0	0	0	Bl	W	Bl	1	100	25-watt	Tungsten	0	1	do	6.0				0.10			1	5	
10b	0	0	1	0	Bl	W	Bl	1	0			0	1	do	7.5	13.0						0	11	
10c	0	0	1	0	Br	Bf	Bl	1	100	30-watt	Gem	0	1	do	7.5				13.2			1	12	
11a	0	0	0	*1	W	W	Bl	1	100	100-watt.	Tungsten	0	1	Turn	6.2				0.325	0.340	0.312	1	2	Up 1 flight.
11b	0	0	0	*1	W	W	Bl	1	100	40-watt	do	0	1	do	6.2	0.010			0.025			1	3	Do.
12	0	0	0	0	Br	Br	Bl	1	100	6 cu. ft.	Flat-flame.	0	1	Landing	5.6				0.013			1	5	
13	0	0	0	0	Br	Br	Bl	2	50	do	do	0	1	do	5.6				0.008			1	6	
14	0	0	0	0	Rd	Bf	Rd	1	100	50-watt	Gem	0	1	do	8.0				0.051			1	4	
15	0	0	0	0	Rd	W	Rd	1	100	do	do	0	1	do	8.0				0.040			1	5	
16	0	0	0	0	Bf	Bf	Al	1	100	40-watt	Tungsten	0	1	do	5.5				0.062			1	2	
18	0	0	0	0	Bf	Bf	Bl	1	0			0	1	do	5.0	0.032						0	2	
19	0	0	0	1	Br	Br	Bl	1	0			0	1	do	5	18.4						0	8	
19	0	1	0	0	Br	Br	Bl	1	0			0	1	do	5	20.0						0	8	
20	0	0	0	0	W	W	Rd	1	0			0	1	do	5.5	0.014						0	3	
20	0	0	1	0	W	W	Rd	1	0			0	1	do	5.5	0.034						0	3	
21	0	0	0	0	W	W	Bl	1	100	50-watt	Gem	0	1	do	7.0				0.088			1	5	
22	0	0	0	0	W	W	Bl	1	100	do	do	0	1	do	6.0				0.071			1	8	

[1] Upright fancy-ground glass.

TABLE 12.—*Illumination on stairs*—Continued.

Shop No.	Windows.				Color.			Number of outlets.	Per cent that will light.	Size of lamps.	Type of lamps.	Type of reflector.	Number of bare lamps.	Location of lamps.	Height above floor.	Illumination average in foot-candles, daylight.	Illumination maximum in foot-candles, daylight.	Illumination minimum in foot-candles, daylight.	Illumination average in foot-candles, daylight, and artificial light.	Illumination maximum in foot-candles, daylight, and artificial light.	Illumination minimum in foot-candles, daylight, and artificial light.	Lights on during observation.	Floor.	Remarks.
	N.	S.	E.	W.	Walls.	Ceilings.	Stairs.																	
23	0	0	1	0	W	W	Bl	1	0	......	......	0	1	do	6.0	0.047	......	......	......	......	......	0	3	
24	0	0	1	0	W	W	Bl	1	0	......	......	0	1	do	5.5	0.064	......	......	......	......	......	0	6	
27	0	1	0	0	Br	Br	Bl	1	100	50-watt	Gem	0	1	Turn	6.0	......	......	......	0.005	......	......	1	3	
30	0	0	0	*0	W	W	Bl	0	......	......	......	......	......	......	......	0.080	......	......	......	......	......	0	3	Skylight 1 flight up.
31	0	0	0	0	G	W	Bl	1	0	......	......	......	......	Turn	6.0	0.080	......	......	......	......	......	0	3	
32	0	0	0	0	Br	Br	Bl	2	100	50-watt	Gem	0	2	do	6.0	......	......	......	0.001	......	......	2	3	
33a	0	0	0	0	Br	Br	Br	3	100	do	do	(1)	0	Landing	8.0	......	......	......	0.021	......	......	3	4	

[1] Ground-glass ball.

TABLE 13.—*Outdoor illuminations, women's garment industries, New York City.*

Date.	Shop No.	Time.	Weather.	Outside illumination.
June 24, 1914	1	1 p. m.	Hazy, clear	317
Do.	1	2 p. m.	do.	325
Do.	1	3 p. m.	do.	242
June 26, 1914	2	10.10 a. m.	Clear	745
Do.	2	11.05 a. m.	do.	1,420
Do.	2	11.40 a. m.	do.	1,614
Do.	2	12.55 p. m.	do.	2,060
Do.	2	1.25 p. m.	do.	1,250
June 27, 1914	3	10.15 a. m.	Hazy, clear	2,400
Do.	3	11.35 a. m.	Clear	3,140
Do.	4	11.30 a. m.	do.	1,810
June 29, 1914	4	12 m.	do.	1,760
Do.	4	1 p. m.	Near rain, overcast.	1,470
June 30, 1914	5	10.20 a. m.	Clear, cumulus	1,950
Do.	5	10.45 a. m.	do.	2,140
Do.	5	12 m.	do.	1,480
Do.	5	12.45 p. m.	do.	1,795
July 1, 1914	6	9.30 a. m.	Clear	677
Do.	6	10 a. m.	do.	945
Do.	6	10.15 a. m.	do.	1,230
Do.	6	11.30 a. m.	Overcast	1,335
Do.	6	1 p. m.	do.	536
Do.	6	1.45 p. m.	do.	522
July 2, 1914	7	12 m.	Clear, cumulus	1,040
Do.	7	12.30 p. m.	do.	1,200
Do.	7	12.55 p. m.	Overcast	1,200
Do.	7	1.05 p. m.	do.	1,430
Do.	7	1.45 p. m.	Clear, cumulus	961
Do.	7	2.45 p. m.	do.	655
July 3, 1914	8	9.30 a. m.	Overcast	1,350
Do.	8	10 a. m.	do.	1,282
Do.	8	10.35 a. m.	do.	1,056
Do.	8	11.15 a. m.	do.	1,048
Do.	8	12 m.	do.	1,162
Do.	8	1 p. m.	do.	1,925
Do.	8	1.30 p. m.	do.	1,780
Do.	8	2 p. m.	do.	890
Do.	8	2.45 p. m.	do.	614
July 7, 1914	9c	1.35 p. m.	do.	770
Do.	9c	2.20 p. m.	do.	1,010
Do.	9c	2.45 p. m.	do.	895
Do.	9c	3.05 p. m.	do.	323
Do.	9c	3.30 p. m.	do.	538
Do.	9c	4 p. m.	do.	1,380
July 8, 1914	9c	10 a. m.	Clear	337
Do.	9c	10.35 a. m.	do.	[1] 3,290
Do.	9c	11.10 a. m.	do.	[2] 297
Do.	9c	12.30 p. m.	do.	315
Do.	9c	1.20 p. m.	do.	308
Do.	9c	2.15 p. m.	do.	264
July 9, 1914	9b	9.30 a. m.	Foggy, clear	1,160
Do.	9b	10.25 a. m.	Clear, hazy	1,980
Do.	9b	10.35 a. m.	do.	1,490
July 10, 1914	9b	9.35 a. m.	Overcast	731
Do.	9b	11.20 a. m.	Hazy, clear	752
Do.	9b	1.20 p. m.	Overcast	1,040
July 11, 1914	9a	9.15 a. m.	Foggy	1,210
Do.	9a	9.30 a. m.	Clear, foggy	1,490
Do.	9a	10.05 a. m.	do.	2,190
July 14, 1914	10b	8.50 a. m.	Overcast	1,020
Do.	10b	9.35 a. m.	do.	799
Do.	10b	10.15 a. m.	do.	569
Do.	10c	12.10 p. m.	do.	1,520
Do.	10c	12.30 p. m.	do.	1,060
Do.	10c	2.45 p. m.	Rain, nimbus	472
July 15, 1914	11a	9.30 a. m.	Clear	1,450
Do.	11a	1.40 p. m.	do.	1,120
July 16, 1914	11b	9.20 a. m.	do.	517
Do.	11b	10.40 a. m.	Clear, cumulus	[1] 2,990
Do.	12	2.15 p. m.	do.	546
Do.	12	3.10 p. m.	do.	400
Do.	12	3.30 p. m.	Rain, nimbus	248
Do.	12	4 p. m.	Clear, cumulus	1,068
July 17, 1914	13	1.30 p. m.	Clear	2,410
Do.	13	2.20 p. m.	do.	990
Do.	13	3 p. m.	do.	824
July 20, 1914	14	1 p. m.	do.	615
Do.	14	2.05 p. m.	do.	276
Do.	15	3 p. m.	do.	323
Do.	15	3.30 p. m.	do.	680

[1] Sun and sky.

[2] Small (0) sky angle.

TABLE 13.—*Outdoor illuminations, women's garment industries, New York City*—Contd.

Date.	Shop No.	Time.	Weather.	Outside illumination.
July 21, 1914	16	10.30 a. m.	Clear	688
Do	16	3.30 p. m.	do	655
Do	16	3.45 p. m.	do	459
Do	16	4.10 p. m.	do	696
Do	16	4.40 p. m.	Thunderstorm, nimbus.	297
July 22, 1914	16	12.30 p. m.	Clear, cumulus	416
Do	17	2.15 p. m.	do	2,050
July 23, 1914	18	12.05 p. m.	Overcast	711
Do	18	2.10 p. m.	Clear, cumulus	1,730
Do	18	2.35 p. m.	Clear	940
July 24, 1914	19	1.20 p. m.	Cumulus, overcast	1,765
Do	19	12.40 p. m.	Overcast	2,040
July 25, 1914	19	2.10 p. m.	do	1,750
July 28, 1914	20	9.30 a. m.	do	434
Do	20	10 a. m.	do	970
Do	20	10.40 a. m.	do	715
Do	20	11.15 a. m.	do	264
Do	20	12 m.	do	297
Do	20	1.40 p. m.	do	157
July 29, 1914	23	9.40 a. m.	Sun and alternate overcast.	2,220
Do	23	10.25 a. m.	Clear, cumulus	560
Do	24	12 m.	do	850
Do	24	3.50 p. m.	Overcast	442
Do	24	4.30 p. m.	Overcast, rain	343
July 30, 1914	21	9.25 a. m.	Overcast	193
Do	21	10.05 a. m.	do	382
Do	21	10.45 a. m.	do	332
Do	21	11.15 a. m.	do	330
Do	22	2.15 p. m.	do	267
Do	22	2.30 p. m.	Nimbus, overcast.	505
Do	22	3.10 p. m.	do	368
Do	22	3.35 p. m.	do	418
Aug. 6, 1914	27	10 a. m.	Overcast	392
Do	27	10.30 a. m.	do	344
Do	28	11.25 a. m.	do	412
Do	29	11.45 a. m.	do	545
Do	29	12.45 p. m.	do	719
Do	30	2 p. m.	Light fog	1,270
Do	31	3.30 p. m.	Light fog and smoke.	1,600
Aug. 7, 1914	26	9.45 a. m.	Clear	665
Do	26	11 a. m.	do	675
Aug. 10, 1914	25b	10 a. m.	do	515
Do	25d	10.45 a. m.	do	683
Do	25c	11.15 a. m.	do	1,464
Do	25f	12 m.	do	847
Do	25e	1 p. m.	do	904
Do	25e	1.20 p. m.	Overcast	1,040
Aug. 12, 1914	32	10 a. m.	Hazy, clear	295
Do	32	10.45 a. m.	do	385
Aug. 14, 1914	33a	10.30 a. m.	Clear	976
Do	33a	12 m.	do	726
Do	33b	3 p. m.	do	[1] 4,880
Aug. 26, 1914	34	9.20 a. m.	Overcast	920
Do	34	12.12 p. m.	Slight overcast	1,730

[1] Sun and sky.

These values of outdoor illumination were taken on horizontal planes just outside the windows of the shops. In many instances the outdoor illumination, as measured, was of a low order when compared with that which would be produced from an unrestricted sky area with similar meteorological conditions. This observed reduction in outside illumination was due to the obstruction presented to an unrestricted sky by the neighboring buildings. Thus, high adjacent buildings and narrow streets and alleys lower the illumination on a horizontal plane at the window fronts, as compared with its unrestricted value.

TABLE 14.—*General summary of conditions of daylight and artificial illumination.*

	Cutting tables.		Basting tables.		Pressing boards.		Designers' machines.		Machines.		Finishing tables.[1]		Designers' cutting tables.		Designers' finishing tables.		Designers' pressing boards.		Button-hole machines.		Stairs.		Total.	
Arrangement of plane relative to window position:	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*
Perpendicular to window	35	46.1	4	9.30	12	25.52	[2] 19	100.0	71	74.75	42	32.1	10	62.5	1	16.6	3	50.0	6	40.0	....	....	203	44.7
Parallel to window	16	21.0	0	0	7	14.88	0	0	24	25.25	11	8.4	6	37.5	5	83.4	3	50.0	5	33.3	....	....	77	17.0
Center	25	32.9	39	90.70	28	59.60	0	0	0	0	78	59.5	0	0	0	0	0	0	4	26.7	....	....	174	38.3
Total	76	100.0	43	100.0	47	100.0	19	100.0	95	100.0	131	100.0	16	100.0	6	100.0	6	100.0	15	100.0	....	....	454	100.0
Lamps used:																								
60-watt carbon	2	0.98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.20
80-watt Gem	0	0	0	0	0	0	0	0	1	0.26	0	0	0	0	0	0	0	0	0	0	0	0	1	0.10
50-watt Gem	15	7.40	0	0	2	2.09	10	33.34	92	24.26	4	2.45	0	0	0	0	1	25.0	3	27.3	15	50.0	142	14.42
35-watt Gem	0	0	0	0	0	0	0	0	1	0.26	0	0	0	0	0	0	0	0	0	0	4	13.33	5	0.51
250-watt tungsten	9	4.43	0	0	13	13.54	0	0	7	1.85	9	5.51	0	0	0	0	0	0	0	0	0	0	38	3.86
150-watt tungsten	11	5.44	3	5.35	1	1.05	2	6.67	2	0.53	3	1.84	1	10.0	2	66.7	1	25.0	0	0	0	0	26	2.64
100-watt tungsten	127	62.50	17	30.41	44	45.80	0	0	64	16.90	42	25.80	4	40.0	0	0	0	0	5	45.4	1	3.33	304	30.90
60-watt tungsten	19	9.37	33	58.87	13	13.54	8	26.65	77	20.30	57	35.00	5	50.0	1	33.3	2	50.0	2	18.2	0	0	217	22.00
40-watt tungsten	0	0	2	3.58	0	0	10	33.34	4	1.06	4	2.45	0	0	0	0	0	0	0	0	2	6.7	22	2.23
25-watt tungsten	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3.33	1	0.10
40-watt tantalum	0	0	0	0	0	0	0	0	3	0.79	0	0	0	0	0	0	0	0	0	0	0	0	3	0.30
Flat flame gas, 6 cubic feet per hour	11	5.44	0	0	19	19.81	0	0	112	29.56	39	23.90	0	0	0	0	0	0	1	9.1	7	23.31	189	19.19
Reflex gas, 3.3 cubic feet per hour	1	0.49	1	1.79	1	1.05	0	0	2	0.53	2	1.22	0	0	0	0	0	0	0	0	0	0	7	0.71
Gas arc, 13.3 cubic feet per hour	7	3.46	0	0	3	3.12	0	0	14	3.70	3	1.83	0	0	0	0	0	0	0	0	0	0	27	2.74
Electric arc, 400 watts	1	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.10
Total	203	100.0	56	100.0	96	100.0	30	100.0	379	100.0	163	100.0	10	100.0	3	100.0	4	100.0	11	100.0	30	100.0	985	100.0
Reflectors:[3]																								
C-8	6	2.94	1	1.69	2	2.02	6	18.20	37	8.46	22	12.40	2	20.0	0	0	0	0	3	25.1	0	0	79	7.36
C-10	13	6.37	9	15.25	0	0	14	42.40	172	39.40	50	28.22	2	20.0	2	66.7	2	40.0	1	8.3	0	0	265	24.62
C-17	25	12.26	3	5.08	2	2.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	2.79
D-10	0	0	0	0	10	10.10	0	0	0	0	1	0.56	0	0	0	0	0	0	0	0	0	0	11	1.02

[1] The unit is the table.

[2] The unit is a bank of machines.

[3] Reflector notation, see Appendix E.

TABLE 14.—*General summary of conditions of daylight and artificial illumination*—Continued.

	Cutting tables.		Basting tables.		Pressing boards.		Designers' machines.		Machines.		Finishing tables.		Designers' cutting tables.		Designers' finishing tables.		Designers' pressing boards.		Button-hole machines.		Stairs.		Total.	
Reflectors:	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*	*No.*	*P. ct.*
D-12	0	0	0	0	2	2.02	1	3.02	12	2.76	0	0	0	0	0	0	0	0	0	0	0	0	15	1.39
D-14	4	1.96	1	1.69	1	1.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0.56
D-18	13	6.37	0	0	5	5.05	0	0	8	1.82	9	5.09	0	0	0	0	0	0	0	0	0	0	35	3.26
XE-60	7	3.43	0	0	0	0	1	3.02	0	0	0	0	1	10.0	0	0	0	0	0	0	0	0	9	5.84
HM-60	27	13.23	9	15.25	7	7.07	0	0	0	0	1	0.56	0	0	0	0	0	0	1	8.3	0	0	45	4.20
HM-40	2	0.98	3	5.08	13	13.12	0	0	0	0	24	13.57	0	0	0	0	0	0	0	0	0	0	42	3.91
F-9	35	17.14	1	1.69	7	7.07	1	3.03	0	0	5	2.82	0	0	0	0	1	20.0	0	0	0	0	50	4.66
E-9	11	5.39	0	0	0	0	3	9.10	0	0	0	0	3	30.0	0	0	0	0	0	0	0	0	17	1.59
B-12	2	0.98	0	0	0	0	0	0	0	0	0	0	0	0	1	33.3	0	0	0	0	0	0	3	0.27
Bare lamps	59	28.92	25	42.41	38	38.40	1	3.03	183	42.00	63	35.64	1	10.0	0	0	2	40.0	7	58.3	32	89.2	411	38.24
S-11	0	0	7	11.86	6	6.06	0	0	0	0	2	1.14	1	10.0	0	0	0	0	0	0	0	0	16	1.49
OB	0	0	0	0	6	6.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0.56
½ tin	0	0	0	0	0	0	6	18.20	24	5.56	0	0	0	0	0	0	0	0	0	0	0	0	30	2.79
Fancy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10.8	5	0.46
Total	204	100.0	59	100.0	99	100.0	33	100.0	436	100.0	177	100.0	10	100.0	3	100.0	5	100.0	12	100.0	37	100.0	1,075	100.0
Arrangement of outlets:																								
Center line fixed, CLF	35	23.70	1	1.58	34	34.0	0	0	89	19.32	59	31.20	0	0	0	0	0	0	1	7.7	0	0	219	19.60
Aisle fixed, AF	2	2.62	0	0	0	0	0	0	3	0.65	1	0.54	0	0	0	0	3	60.0	0	0	0	0	9	0.81
Center line drop, CLD	149	60.50	50	79.40	65	65.0	14	42.45	194	42.20	119	63.50	8	80.0	2	66.7	2	40.0	11	84.6	0	0	614	54.01
Double rows drop, DD	3	1.32	0	0	0	0	19	57.55	134	29.15	0	0	0	0	0	0	0	0	0	0	0	0	156	14.01
Double rows fixed, DF	0	0	0	0	0	0	0	0	16	3	0	0	0	0	0	0	0	0	0	0	0	0	16	1.43
Double rows adjustable, DA	0	0	0	0	0	0	0	0	24	5.21	0	0	0	0	0	0	0	0	0	0	0	0	24	2.15
Aisle drop, AD	11	10.52	10	15.85	1	1.0	0	0	0	0	9	4.76	2	20.0	1	33.3	0	0	1	7.7	0	0	35	3.14
Off center drop, ED	0	0	2	3.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.18
Off center fixed, EF	4	1.31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[1]37	100.0	41	3.67
Total	204	100.0	63	100.0	100	100.0	33	100.0	460	100.0	188	100.0	10	100.0	3	100.0	5	100.0	13	100.0	37	100.0	1,116	100.0

Illumination:																								
Planes with illumination of less than 5 foot-candles	43	62.30	35	83.43	101	57.7	1	6.25	192	44.5	[2]85	50.32	6	37.5	1	16.7	3	37.5	11	55.0	30	81.1	508	52.5
Planes with illumination of less than 1 foot-candle	8	11.59	11	26.20	41	23.4	0	0	71	16.4	19	11.25	0	0	0	0	0	0	0	0	29	78.3	179	18.7
Planes with illumination of less than 0.1 foot-candle	1	1.45	0	0	0	0	0	0	4	0.9	0	0	0	0	0	0	0	0	3	15.0	27	73.0	35	3.65
Workers on stations	152	....	...	....	175	....	56	....	432	....	610	....	13	....	6	....	8	....	20	....	....	....	1,472	......
Lamps which cause glare	144	87.2	47	94.0	85	90.5	21	70.0	220	69.2	123	97.7	8	100.0	3	100.0	5	100.0	9	81.8	26	83.9	691	82.0

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[1]=Wall brackets.

[2] The unit is the space occupied by one finisher.

APPENDIX D.

EXAMPLE OF REARRANGEMENT OF WORKING PLANES IN A WORKSHOP IN ORDER TO SECURE BETTER ILLUMINATION.

The following figure (fig. 1) shows the existing arrangement of the working planes in one of the shops surveyed:

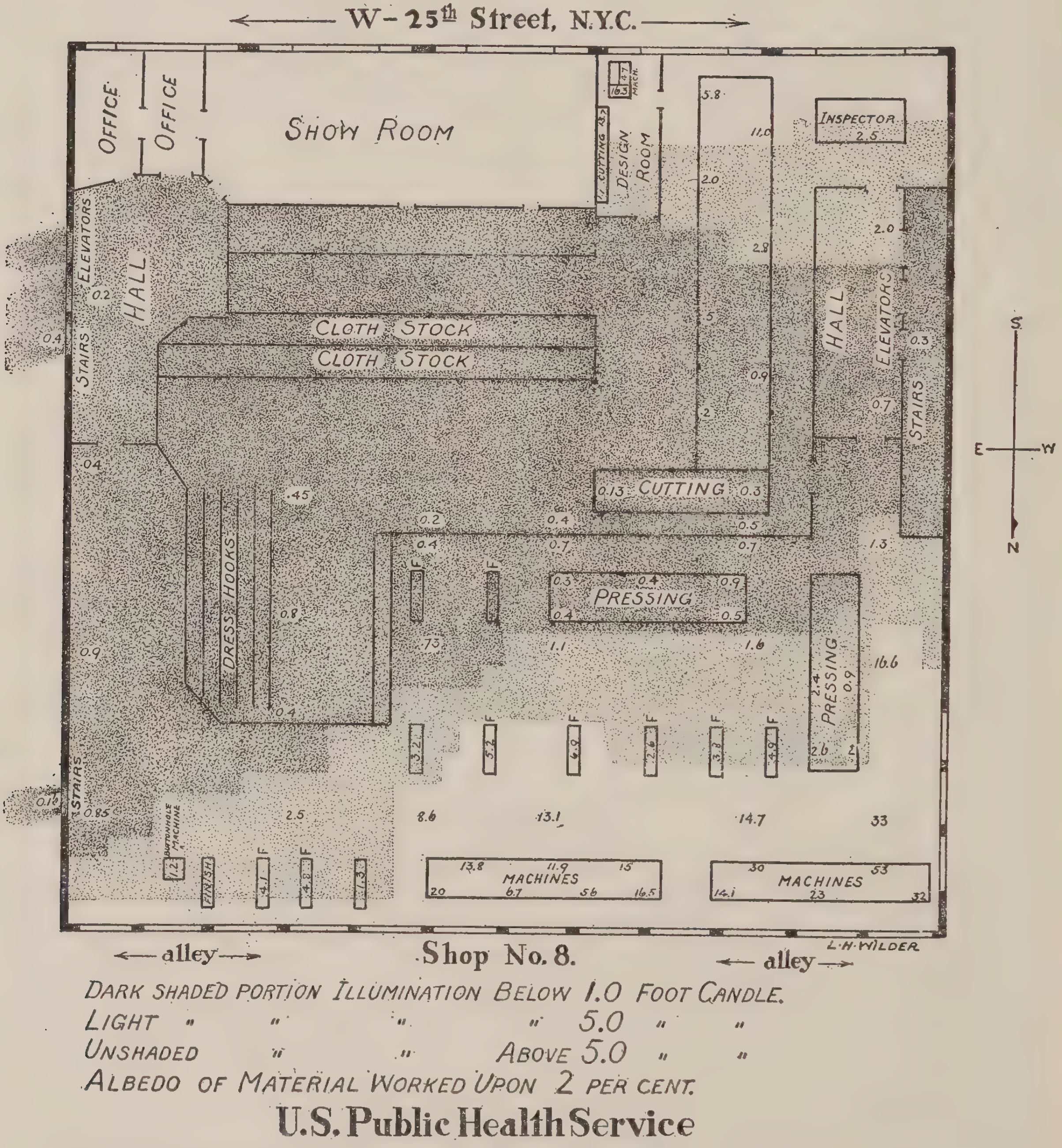


FIG. 1.—Poor utilization of daylight illumination in workroom of women's garment industry.

The arrangement of the working planes relative to windows is typical of some of the conditions found. The dark-shaded portions show the part of the workroom in which the daylight illumination was less than 1 foot-candle, the light-shaded portions show the area in which the illumination was between 1 and 5 foot-candles, and the clear portions correspond to daylight illuminations exceeding 5 foot-candles. Only a little over 12 per cent of the total area of the work-room is utilized for working planes.

The following figure (fig. 2) shows how, by a rearrangement of the working planes, the existing daylight illuminatior is used to much better advantage:

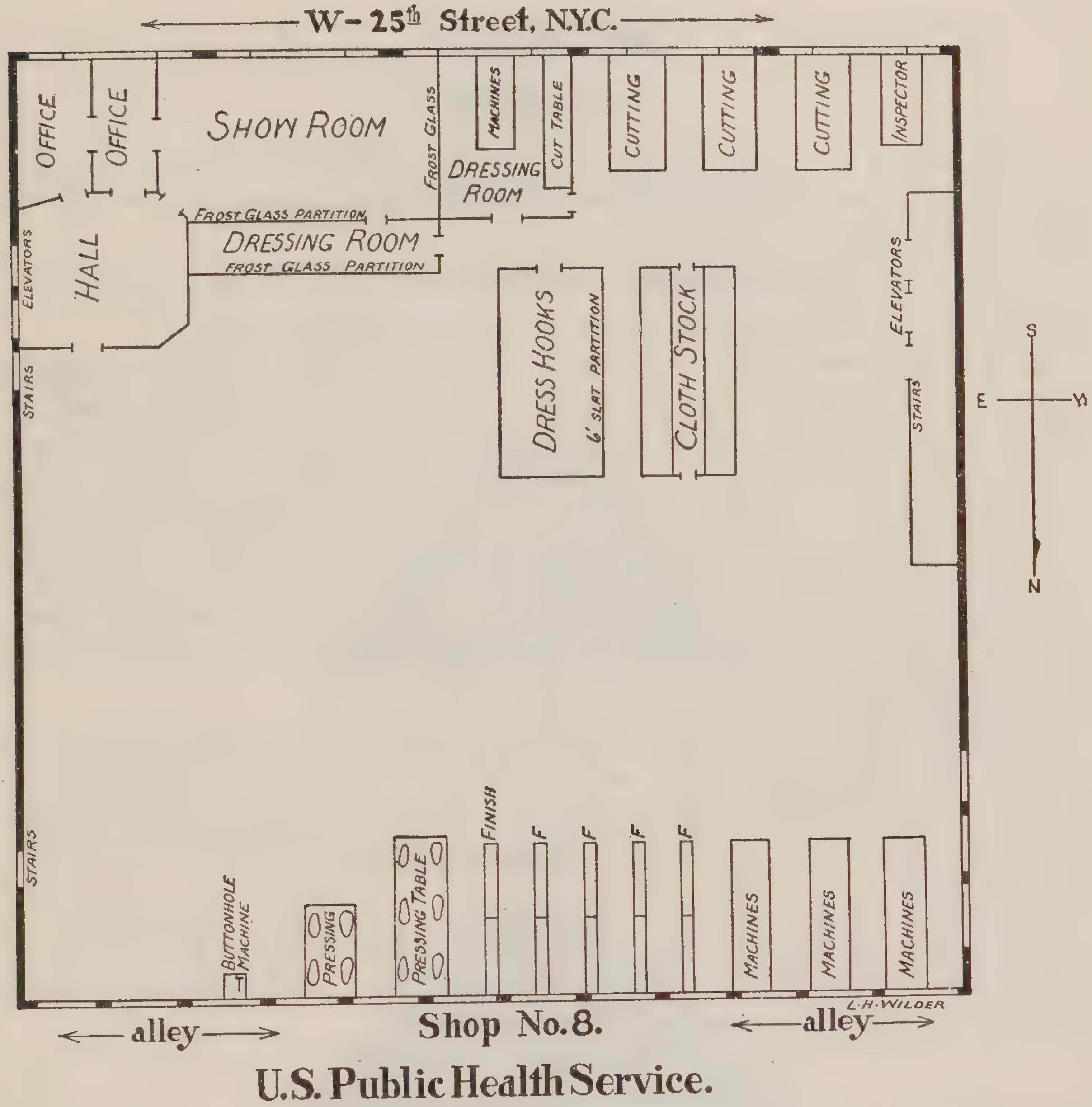


FIG. 2.—Rearrangement of working planes shown in Fig. 1 to secure better illumination.

Reference to the figure shows that all the working planes are in areas where they will receive daylight illumination of at least 5 foot-candles. It is evident that the owner of the workshop is paying for a considerable area of useless floor space.

APPENDIX E.

REFLECTORS.

Reflectors for local illumination.—The basic requirements for reflectors to be used for intense local illumination are as follows (Plates VII–IX):

1. No part of the luminous source should be visible to the worker for any normal position of the head at the working plane.

2. A large proportion of the available flux of light from the source should be uniformly distributed by the reflector over the working plane. The total output of light (which is measured in lumens) being a fixed quantity for any particular source, it follows that the illumination of any working plane lit by the source in question will be proportional to the number of effective lumens from the source concentrated on the plane by the reflector. Reflectors permitting much flux from the source to wander in other directions will not be efficient in local illumination.

Samples of the reflectors commonly used for local illumination in the shops surveyed were secured. Their respective distribution curves in combination with light sources of the types usually employed in workshops of the garment trades were determined by the Bureau of Standards, Washington, D. C.

The following figures (figs. 1 to 11) show the types of reflectors for which the distribution curves were determined, and figures 12 to 39 show the distribution results obtained.

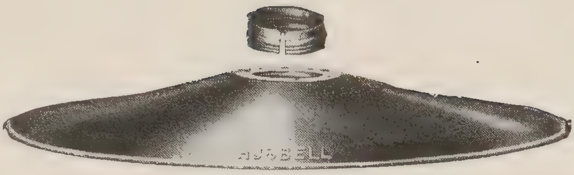


Fig. 1.—Type of reflector D-10, 12, 14, 16.

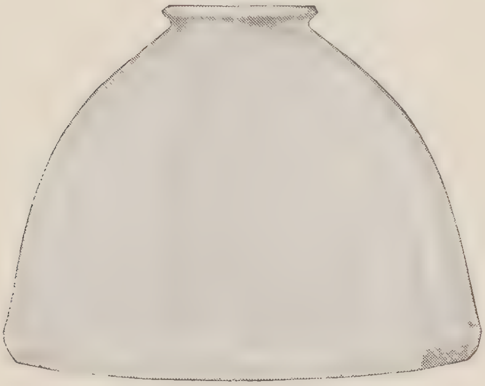


Fig. 2.—Type of reflector OB.

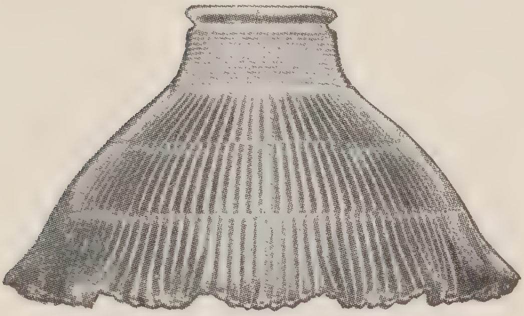


Fig. 3.—Type of reflector F-9.

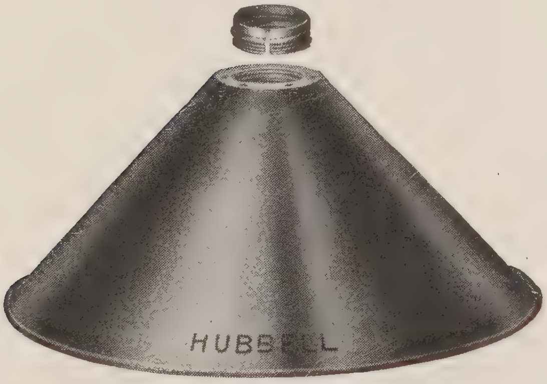


Fig. 4.—Type of reflectors C-8 and C-10.

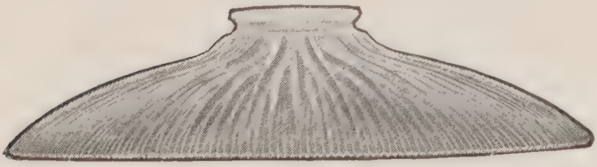


Fig. 5.—Type of reflector HM-40, HM-60, S-11.

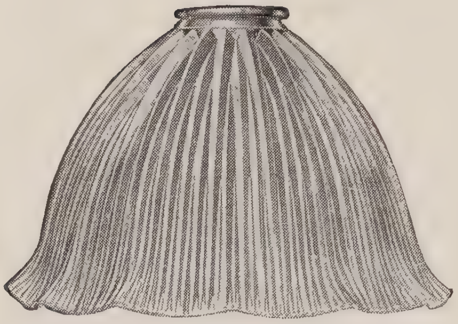


Fig. 6.—Type of reflector H-9673, XE-60.

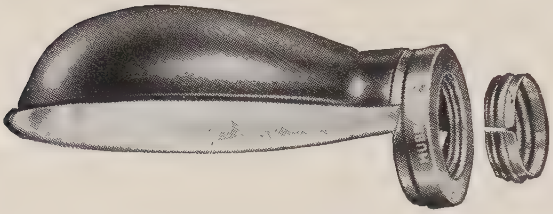


Fig. 7.—Type of reflector, one-half tin.

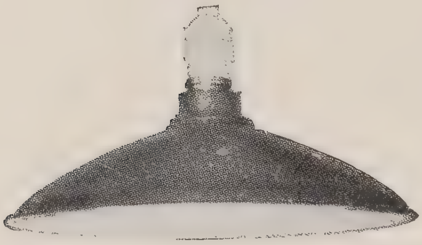


Fig. 8.—Type of reflector B-12.

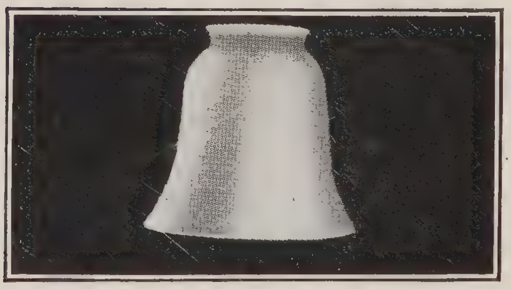


Fig. 9.—Type of reflector, fancy.

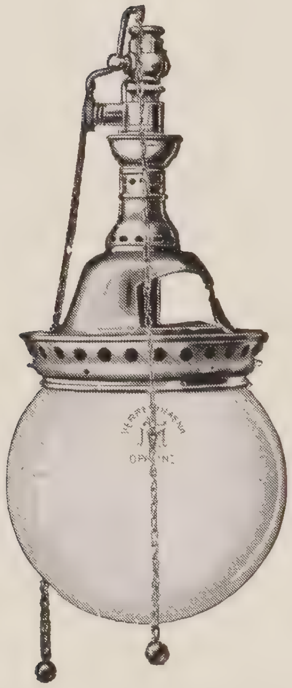


Fig. 10.—Reflex gas lamp.

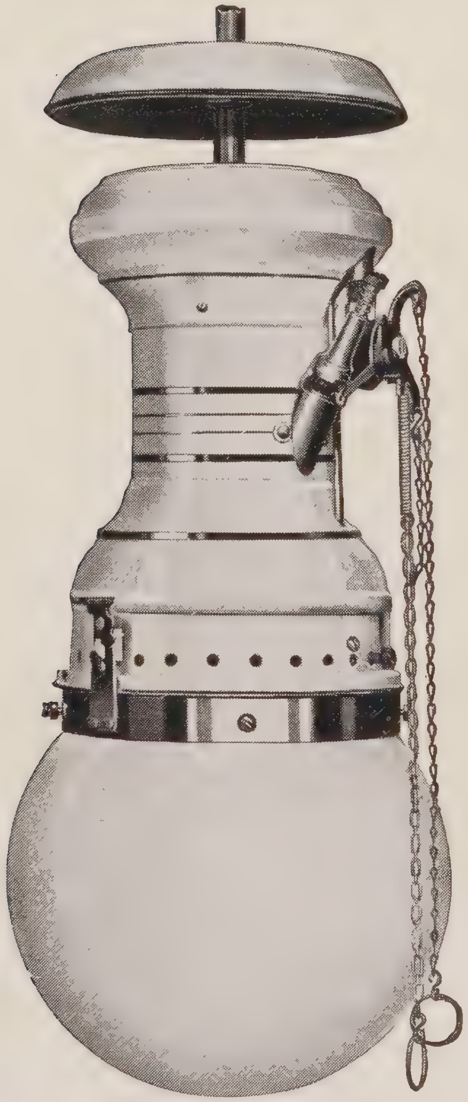


Fig. 11.—Four-mantle gas "arc" lamp.

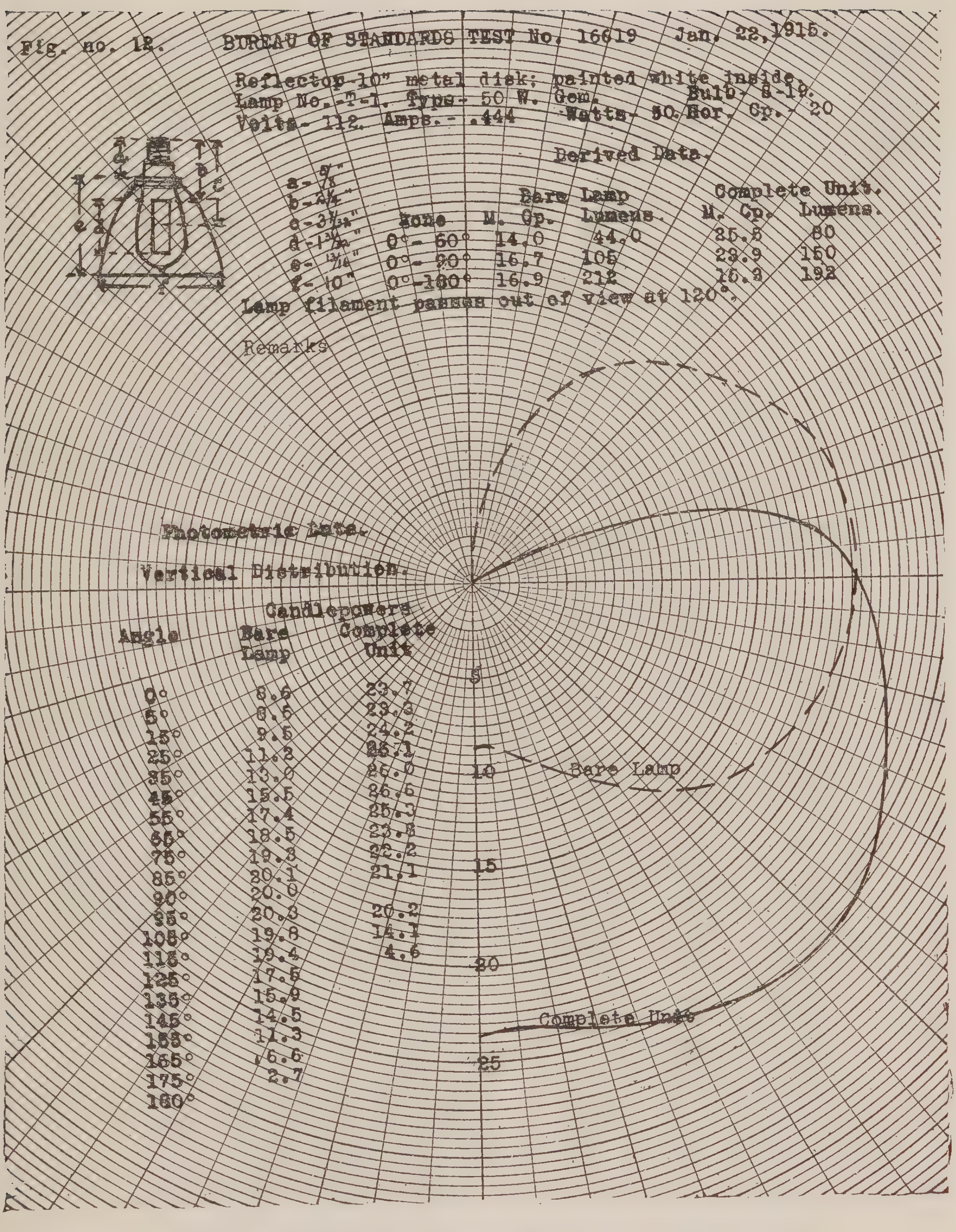


Fig. no. 12. BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector-10" metal disk; painted white inside.
Lamp No.-T-1. Type- 50 W. Gem. Bulb- S-19.
Volts- 112. Amps.- .444 Watts- 50. Hor. Cp.- 20

a- 5/8"
b- 2¼"
c- 3 1/32"
d- 1 31/32"
e- 13/16"
f- 10"

Derived Data.

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens.	Complete Unit. M. Cp.	Complete Unit. Lumens.
0°- 60°	14.0	44.0	25.5	80
0°- 90°	16.7	105	23.9	150
0°-180°	16.9	212	15.3	192

Lamp filament passes out of view at 120°.

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	8.6	23.7
5°	8.5	23.3
15°	9.5	24.2
25°	11.2	25.1
35°	13.0	26.0
45°	15.5	26.6
55°	17.4	25.3
65°	18.5	23.8
75°	19.3	22.2
85°	20.1	21.1
90°	20.0	
95°	20.3	20.2
105°	19.8	14.1
115°	19.4	4.6
125°	17.5	
135°	15.9	
145°	14.5	
155°	11.3	
165°	6.6	
175°	2.7	
180°		

FIG. 12.—Distribution curve of reflector D-10 and 50-watt gem lamp.

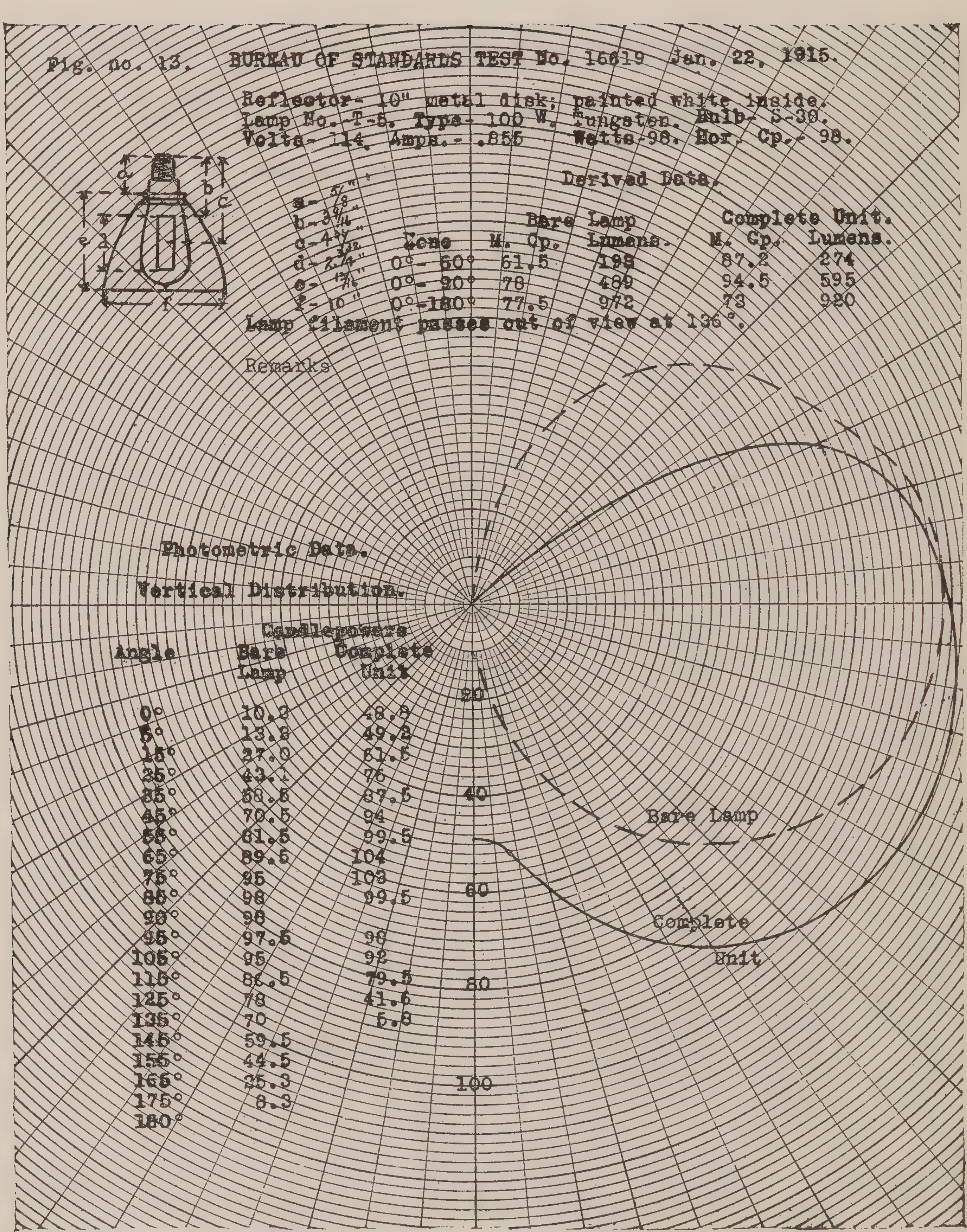


Fig. no. 13. BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector- 10" metal disk; painted white inside.
Lamp No.-T-5. Type- 100 W. Tungsten. Bulb- S-30.
Volts- 114. Amps.- .855 Watts-98. Hor. Cp.- 98.

a- 5/8"
b- 3 3/4"
c- 4 7/32"
d- 2 1/4"
e- 13/16"
f- 10"

Derived Data.

	Bare Lamp		Complete Unit.	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0°- 60°	61.5	198	87.2	274
0°- 90°	78	489	94.5	595
0°-180°	77.5	972	73	920

Lamp filament passes out of view at 136°.

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	10.3	48.8
5°	13.3	49.2
15°	27.0	61.5
25°	43.1	76
35°	58.5	87.5
45°	70.5	94
55°	81.5	99.5
65°	89.5	104
75°	95	103
85°	98	99.5
90°	98	
95°	97.5	98
105°	95	92
115°	86.5	79.5
125°	78	41.6
135°	70	5.8
145°	59.5	
155°	44.5	
165°	25.3	
175°	8.3	
180°		

FIG. 13.—Distribution curve of reflector D-10 and 100-watt tungsten lamp.

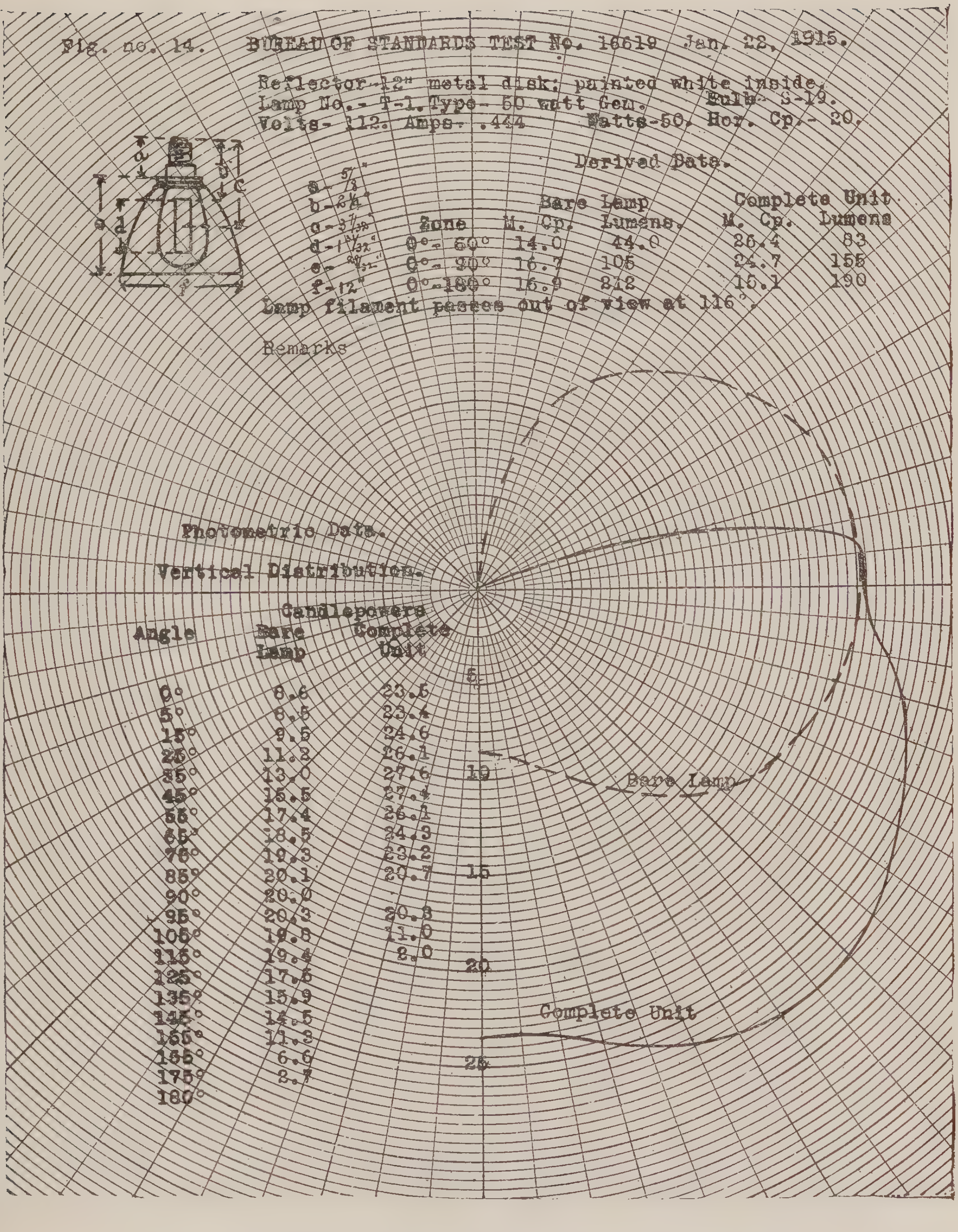


Fig. no. 14. BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector-12" metal disk; painted white inside.
Lamp No.- T-1. Type- 50 watt Gem. Bulb- S-19.
Volts- 112. Amps- .444 Watts-50. Hor. Cp.- 20.

a - 5/8"
b - 2¼"
c - 3 7/32"
d - 1 11/32"
e - 21/32"
f - 12"

Derived Data.

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens.	Complete Unit M. Cp.	Complete Unit Lumens
0°- 60°	14.0	44.0	26.4	83
0°- 90°	16.7	105	24.7	155
0°-180°	16.9	212	15.1	190

Lamp filament passes out of view at 116°.

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	8.6	23.5
5°	8.5	23.4
15°	9.5	24.6
25°	11.2	26.1
35°	13.0	27.6
45°	15.5	27.4
55°	17.4	26.1
65°	18.5	24.3
75°	19.3	23.2
85°	20.1	20.7
90°	20.0	
95°	20.3	20.3
105°	19.8	11.0
115°	19.4	2.0
125°	17.5	
135°	15.9	
145°	14.5	
155°	11.3	
165°	6.6	
175°	2.7	
180°		

FIG. 14.—Distribution curve of reflector D-12 and 50-watt gem lamp.

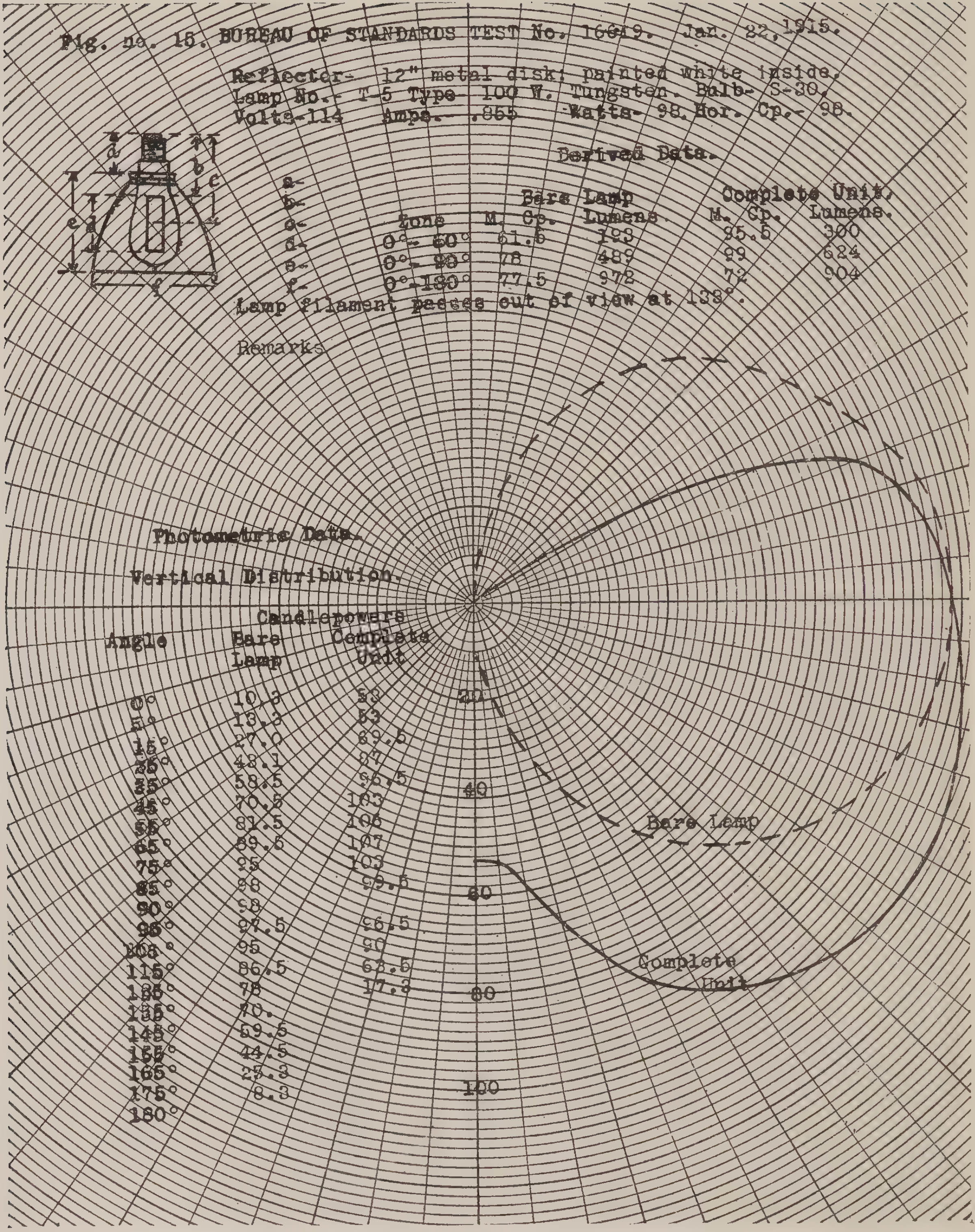


Fig. no. 15. BUREAU OF STANDARDS TEST No. 16619. Jan. 22, 1915.

Reflector- 12" metal disk; painted white inside.
Lamp No.- T-5 Type- 100 W. Tungsten. Bulb- S-30.
Volts-114 Amps.- .855 Watts- 98. Hor. Cp.- 98.

Derived Data.

a-
b-
c-
d-
e-
f-

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens.	Complete Unit. M. Cp.	Complete Unit. Lumens.
0°- 60°	61.5	193	95.5	300
0°- 90°	78	489	99	624
0°-180°	77.5	972	72	904

Lamp filament passes out of view at 133°.

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	10.3	53
5°	13.3	53
15°	27.0	69.5
25°	48.1	87
35°	58.5	96.5
45°	70.5	103
55°	81.5	106
65°	89.6	107
75°	95	103
85°	98	99.5
90°	98	
95°	97.5	96.5
105°	95	90
115°	86.5	63.5
125°	78	17.3
135°	70.	
145°	59.5	
155°	44.5	
165°	25.3	
175°	8.3	
180°		

FIG. 15.—Distribution curve of reflector D-12 and 100-watt tungsten lamp.

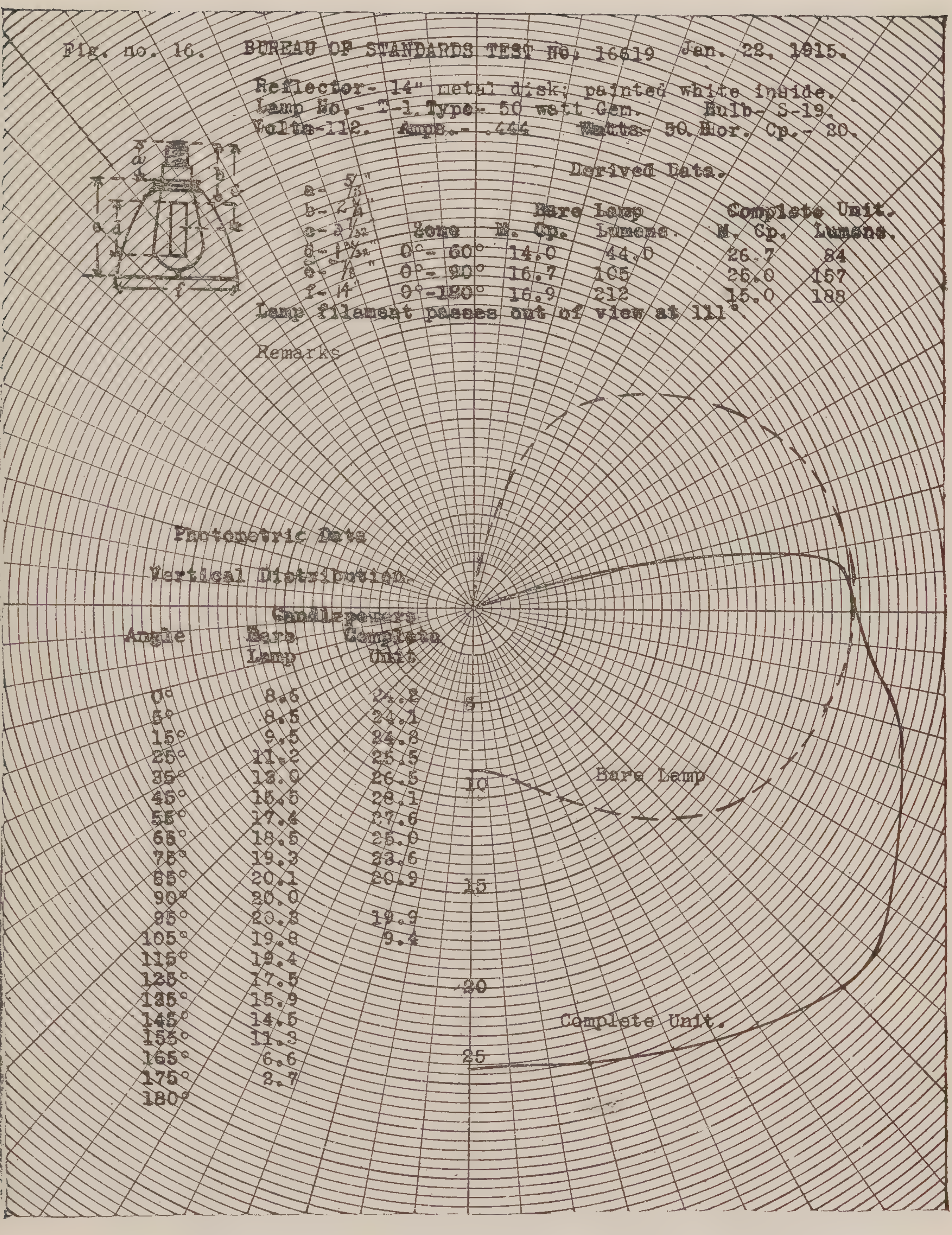


Fig. no. 16. BUREAU OF STANDARDS TEST NO. 16619 Jan. 22, 1915.

Reflector- 14" metal disk; painted white inside.
Lamp No.- T-1 Type- 50 watt Gem. Bulb- S-19.
Volts-112. Amps.- .444 Watts- 50. Hor. Cp.- 30.

Derived Data.

a- 5/8"
b- 2 1/4"
c- 3 1/32"
d- 1 15/32"
e- 7/8"
f- 14"

	Bare Lamp		Complete Unit.	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0°- 60°	14.0	44.0	26.7	84
0°- 90°	16.7	105	25.0	157
0°-180°	16.9	212	15.0	188

Lamp filament passes out of view at 111°.

Remarks

Photometric Data

Vertical Distribution.

	Candlepowers	
Angle	Bare Lamp	Complete Unit
0°	8.5	24.2
5°	8.5	24.1
15°	9.5	24.3
25°	11.2	25.5
35°	13.0	26.5
45°	15.5	28.1
55°	17.4	27.6
65°	18.5	25.0
75°	19.3	23.6
85°	20.1	20.9
90°	20.0	
95°	20.3	19.9
105°	19.8	9.4
115°	19.4	
125°	17.5	
135°	15.9	
145°	14.5	
155°	11.3	
165°	6.6	
175°	2.7	
180°		

FIG. 16.—Distribution curve of reflector D-14 and 50-watt gem lamp.

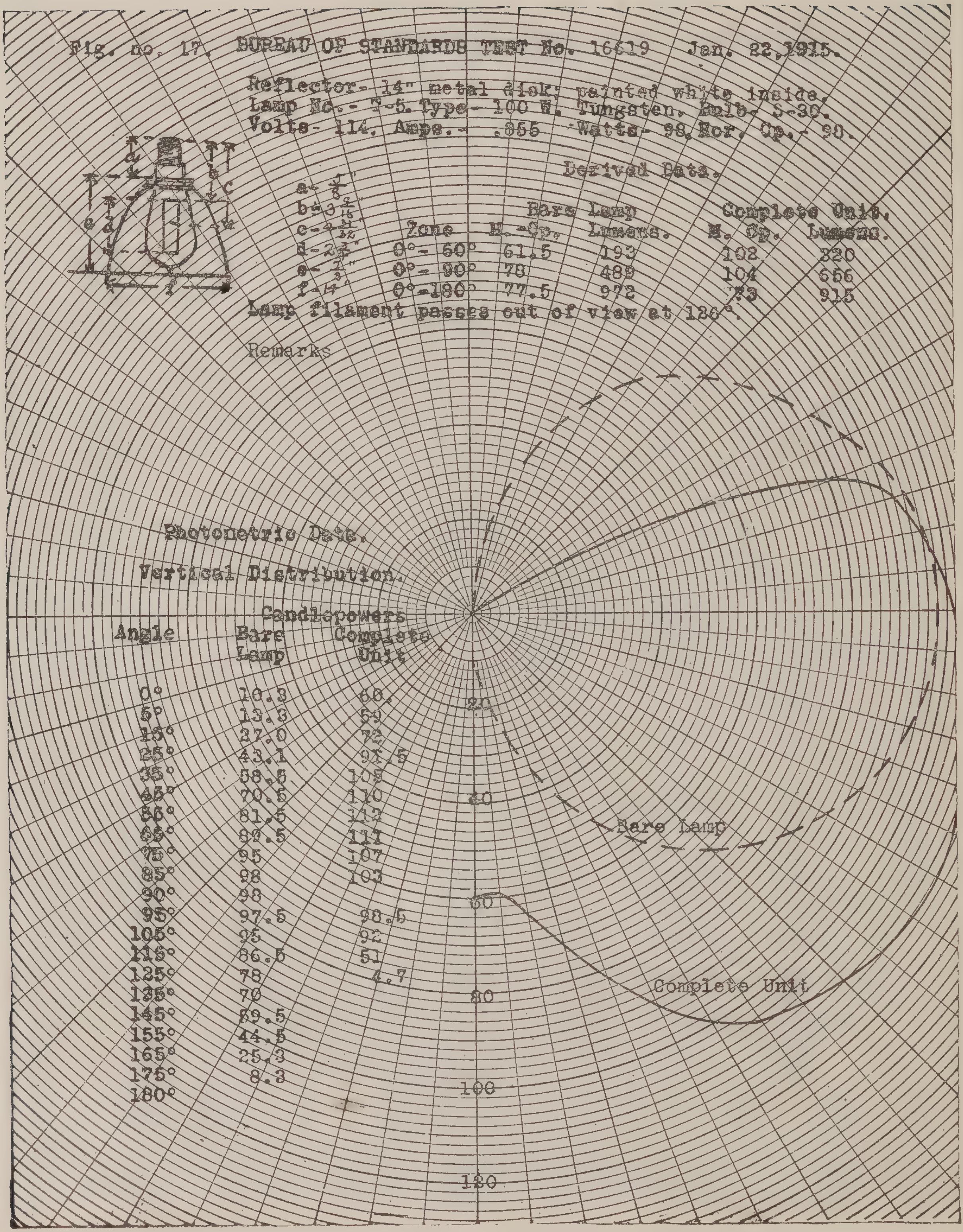


Fig. no. 17. BUREAU OF STANDARDS TEST No. 16619 Jan. 22,1915.

Reflector- 14" metal disk; painted white inside.
Lamp No.- T-5. Type- 100 W. Tungsten. Bulb- S-30.
Volts- 114. Amps.- .855 Watts- 98. Hor. Cp.- 90.

a- 5/8"
b- 3 9/16"
c- 4 11/32"
d- 2 3/8"
e- 7/8"
f- 14"

Derived Data.

Zone	Bare Lamp M.-Cp.	Bare Lamp Lumens.	Complete Unit. M. Cp.	Complete Unit. Lumens.
0°- 60°	61.5	193	102	320
0°- 90°	78	489	104	656
0°-180°	77.5	972	73	915

Lamp filament passes out of view at 126°.

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	10.3	60.
5°	13.3	59
15°	27.0	72
25°	43.1	91.5
35°	58.5	105
45°	70.5	110
55°	81.5	112
65°	89.5	111
75°	95	107
85°	98	103
90°	98	
95°	97.5	98.5
105°	95	92
115°	86.5	51
125°	78	4.7
135°	70	
145°	59.5	
155°	44.5	
165°	25.3	
175°	8.3	
180°		

FIG. 17.—Distribution curve of reflector D-14 and 100-watt tungsten lamp.

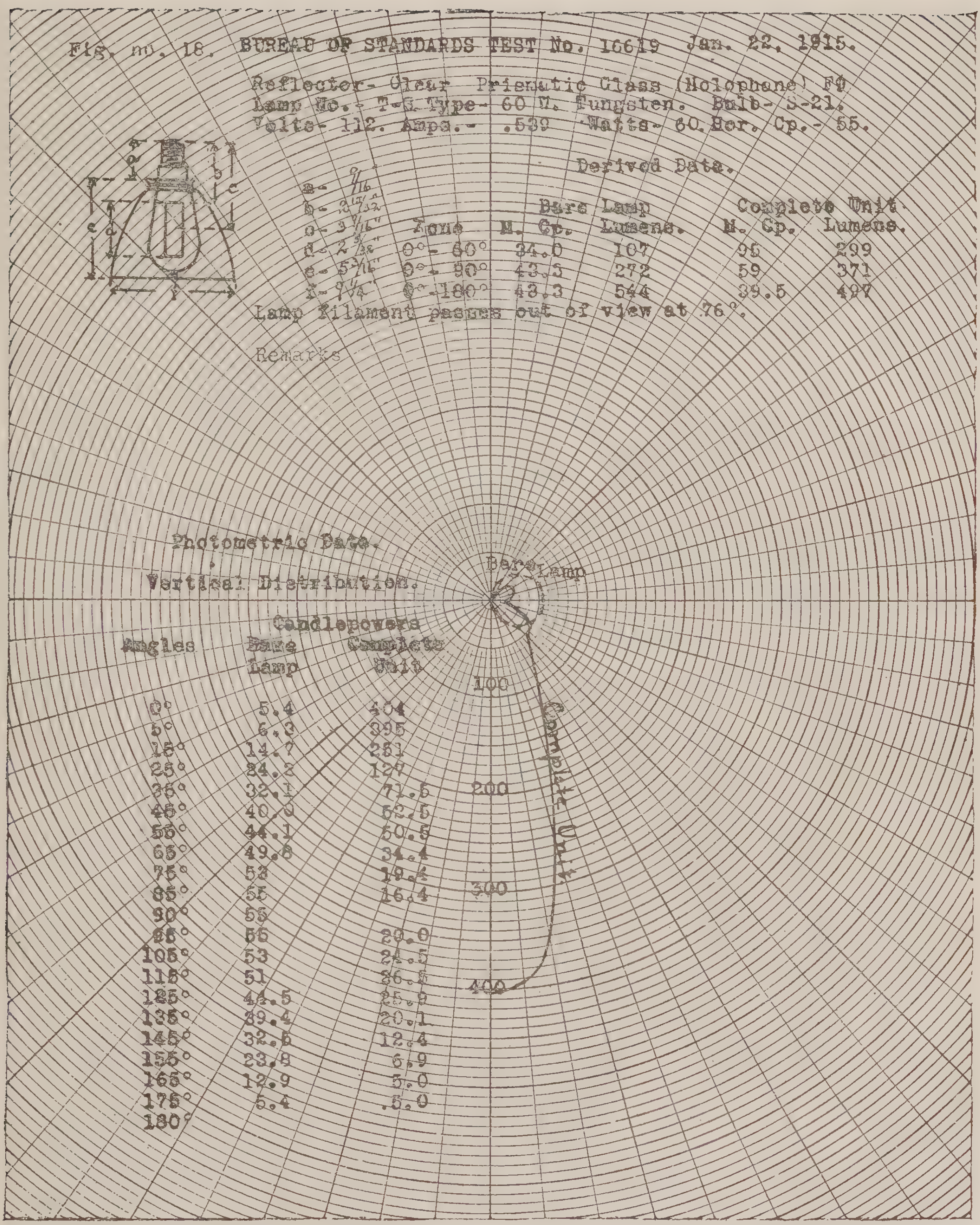


Fig. no. 18. BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector- Clear Prismatic Glass (Holophane) F9
Lamp No.- T-5 Type- 60 W. Tungsten. Bulb- S-21.
Volts- 112. Amps.- .539 Watts- 60. Hor. Cp.- 55.

a- 9/16
b- 2 17/32
c- 3 9/16"
d- 2 3/32"
e- 5 7/16"
f- 9 1/4

Derived Data.

	Bare Lamp		Complete Unit	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0° - 60°	34.0	107	95	299
0° - 90°	43.3	272	59	371
0° -180°	43.3	544	39.5	497

Lamp Filament passes out of view at 76°.

Remarks

Photometric Data.

Vertical Distribution.

	Candlepowers	
Angles	Bare Lamp	Complete Unit
0°	5.4	404
5°	6.3	395
15°	14.7	251
25°	24.2	127
35°	32.1	71.5
45°	40.0	62.5
55°	44.1	50.5
65°	49.8	34.4
75°	53	19.4
85°	55	16.4
90°	55	
95°	55	20.0
105°	53	24.5
115°	51	26.5
125°	44.5	25.9
135°	39.4	20.1
145°	32.6	12.4
155°	23.8	6.9
165°	12.9	5.0
175°	5.4	5.0
180°		

FIG. 18.—Distribution curve of reflector F-9 and 60-watt tungsten lamp (small bulb).

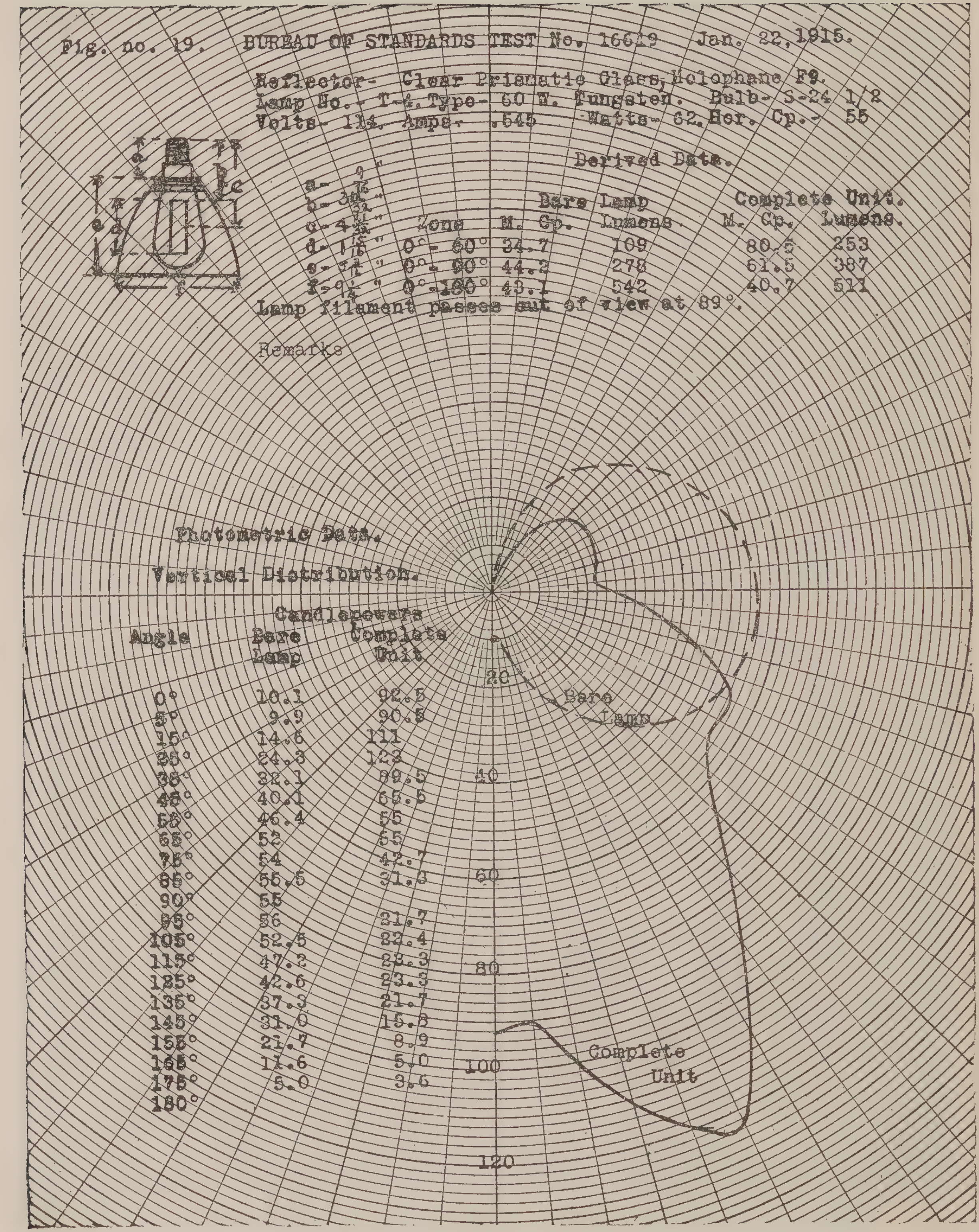


Fig. no. 19. BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector- Clear Prismatic Glass, Holophane F9.
Lamp No.- T-4. Type- 60 W. Tungsten. Bulb- S-24 1/2
Volts- 114. Amps- .545 Watts- 62. Hor. Cp.- 55

Derived Data.

a- 9/16"
b- 3 11/32"
c- 4 11/32"
d- 1 15/16"
e- 5 3/16"
f- 9 1/4"

	Bare Lamp		Complete Unit.	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0°- 60°	34.7	109	80.5	253
0°- 90°	44.2	278	61.5	387
0°-180°	43.1	542	40.7	511

Lamp filament passes out of view at 89°.

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	10.1	92.5
5°	9.9	90.5
15°	14.6	111
25°	24.3	123
35°	32.1	89.5
45°	40.1	65.5
55°	46.4	55
65°	52	55
75°	54	42.7
85°	55.5	31.3
90°	55	
95°	56	31.7
105°	52.5	22.4
115°	47.2	23.3
125°	42.6	23.3
135°	37.3	21.7
145°	31.0	15.8
155°	21.7	8.9
165°	11.6	5.0
175°	5.0	3.6
180°		

FIG. 19.—Distribution curve of reflector F-9 and 60-watt tungsten lamp (large bulb.)

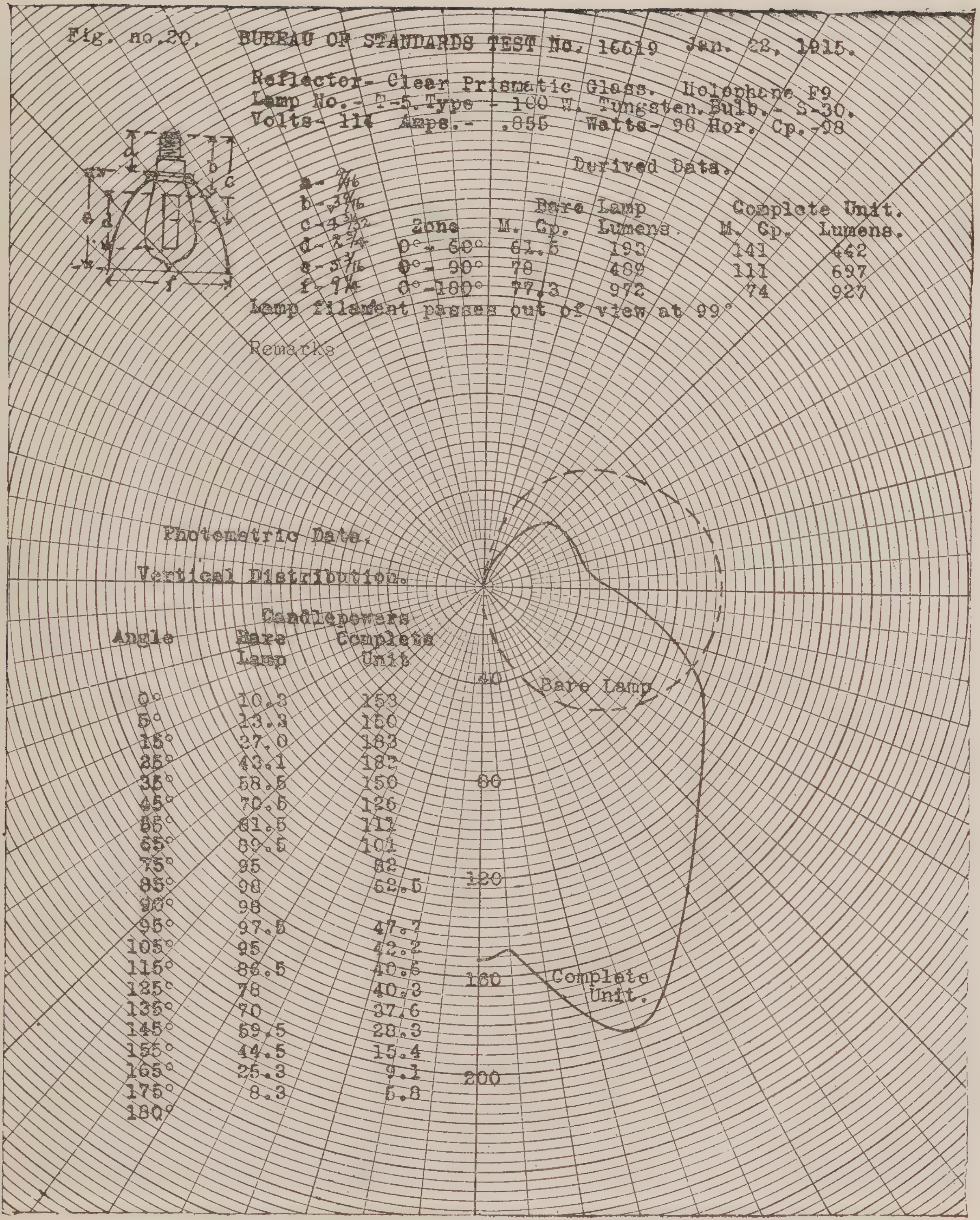


Fig. no. 20. BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector- Clear Prismatic Glass. Holophane F9
Lamp No.- T-5. Type - 100 W. Tungsten. Bulb. - S-30.
Volts- 114 Amps.- .855 Watts- 98 Hor. Cp.-98

a- $\frac{9}{16}$
b- $3\frac{3}{16}$
c- $4\frac{3}{32}$
d- $2\frac{3}{4}$
e- $5\frac{1}{16}$
f- $7\frac{1}{4}$

Derived Data.

	Bare Lamp		Complete Unit.	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0° - 60°	61.5	193	141	442
0° - 90°	78	489	111	697
0° -180°	77.3	972	74	927

Lamp filament passes out of view at 99°

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Complete Unit
0°	10.3	153
5°	13.3	150
15°	27.0	183
25°	43.1	182
35°	58.5	150
45°	70.5	126
55°	81.5	111
65°	89.5	101
75°	95	82
85°	98	62.5
90°	98	
95°	97.5	47.7
105°	95	42.2
115°	86.5	40.5
125°	78	40.3
135°	70	37.6
145°	59.5	28.3
155°	44.5	15.4
165°	25.3	9.1
175°	8.3	5.8
180°		

FIG. 20.—Distribution curve of reflector F-9 and 100-watt tungsten lamp.

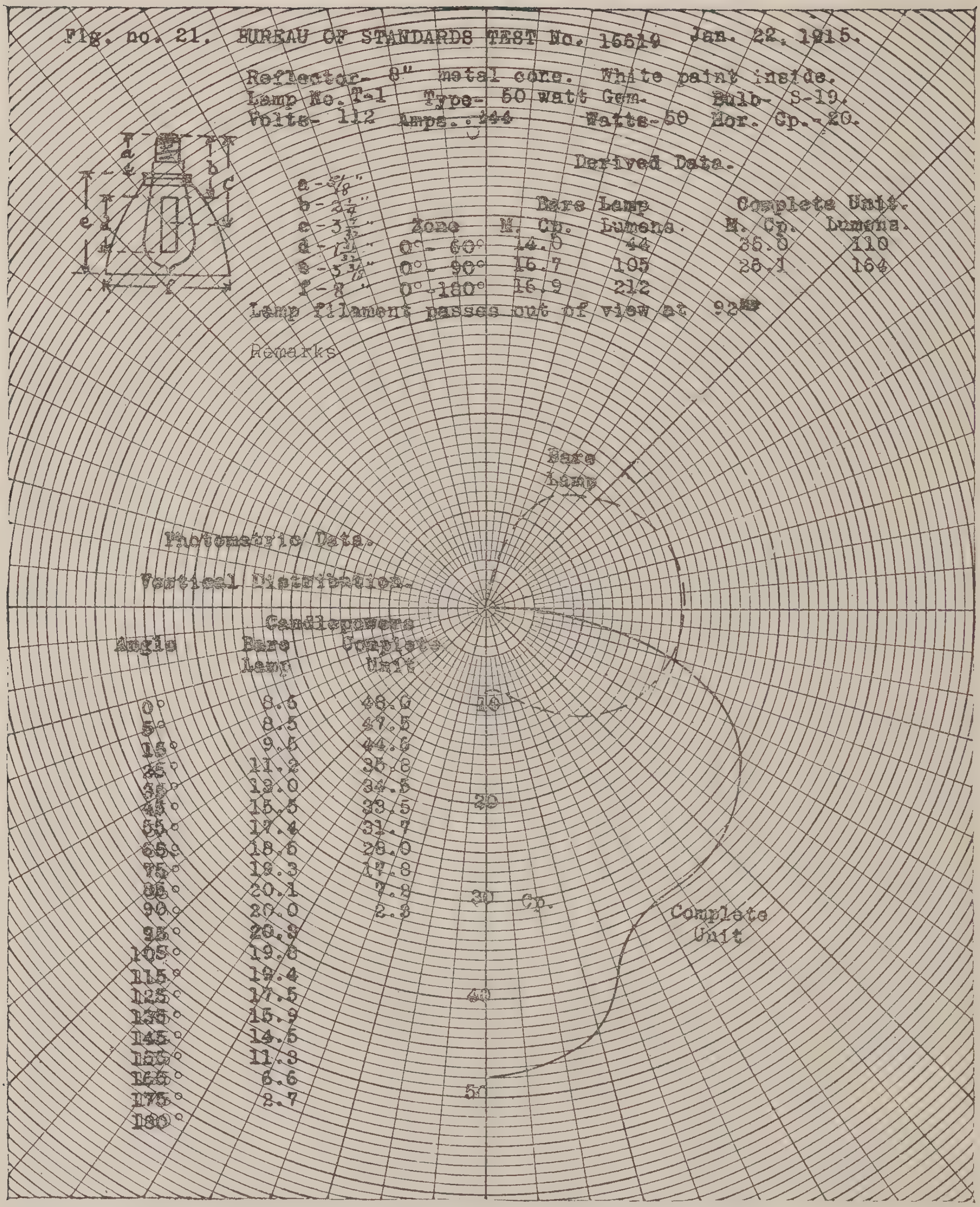


Fig. no. 21. BUREAU OF STANDARDS TEST No. 15619 Jan. 22, 1915.

Reflector- 8" metal cone. White paint inside.
Lamp No. T-1 Type- 50 watt Gem. Bulb- S-19.
Volts- 112 Amps. .444 Watts-50 Hor. Cp.-20.

a - 5/8"
b - 2 1/4"
c - 3 7/32"
d - 1 3/32"
e - 3 3/16"
f - 8"

Derived Data.

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens	Complete Unit M. Cp.	Complete Unit Lumens
0°- 60°	14.0	44	35.0	110
0°- 90°	16.7	105	26.1	164
0°-180°	16.9	212		

Lamp filament passes out of view at 92°

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	8.5	48.0
5°	8.5	47.5
15°	9.5	44.6
25°	11.2	35.8
35°	13.0	34.5
45°	15.5	33.5
55°	17.4	31.7
65°	18.6	28.0
75°	19.3	17.8
85°	20.1	7.8
90°	20.0	2.3
95°	20.3	
105°	19.8	
115°	19.4	
125°	17.5	
135°	15.9	
145°	14.5	
155°	11.3	
165°	6.6	
175°	2.7	
180°		

FIG. 21.—Distribution curve of reflector C-8 and 50-watt gem lamp.

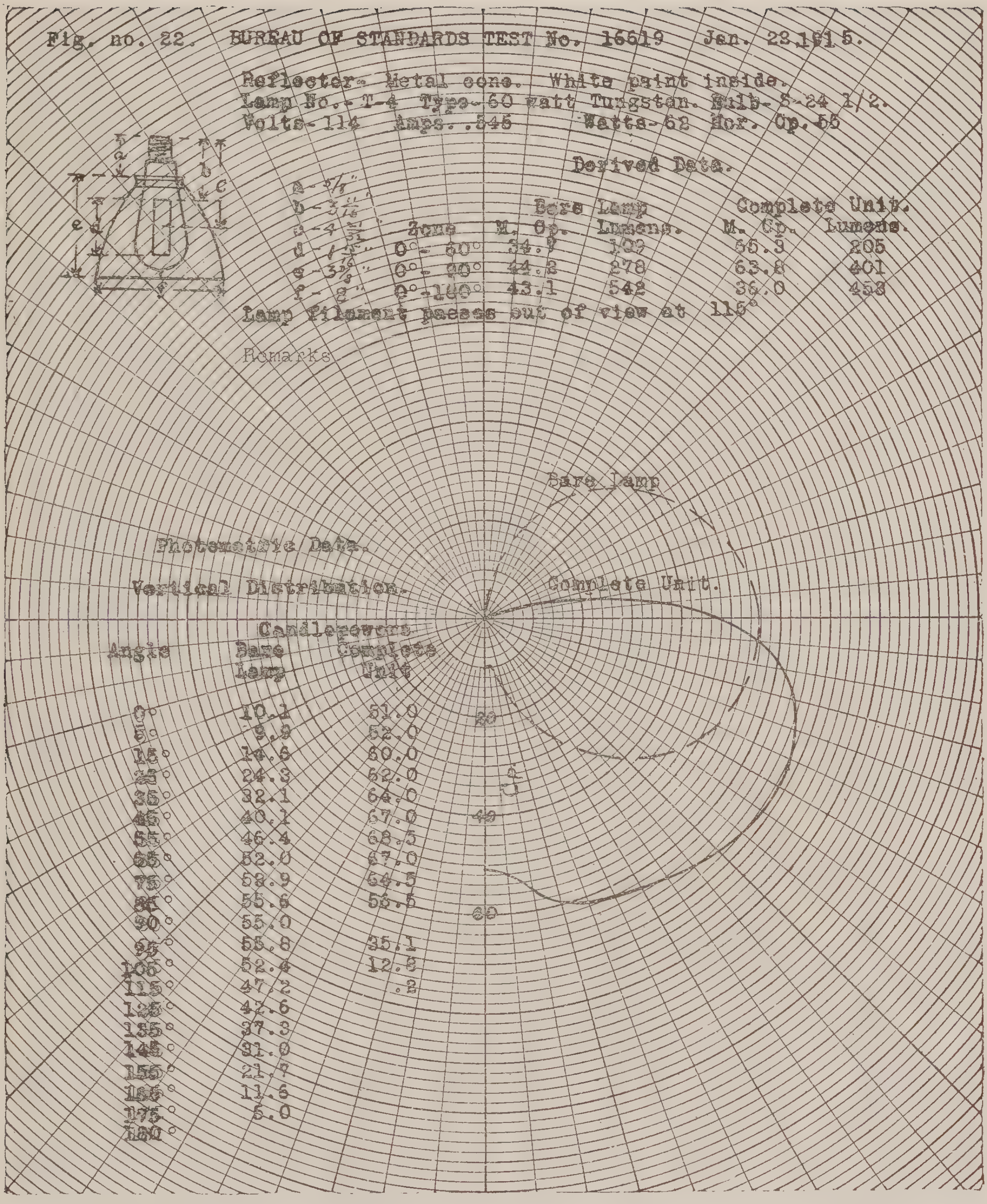


Fig. no. 22. BUREAU OF STANDARDS TEST No. 16519 Jan. 23,1915.

Reflector- Metal cone. White paint inside.
Lamp No.- T-4 Type- 60 watt Tungsten. Bulb- S-24 1/2.
Volts- 114 Amps. .545 Watts- 62 Hor. Cp. 55

Derived Data.

	Bare Lamp		Complete Unit.	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0°- 60°	34.7	109	65.3	205
0°- 90°	44.2	278	63.8	401
0°-180°	43.1	542	36.0	453

Lamp Filament passes out of view at 115°

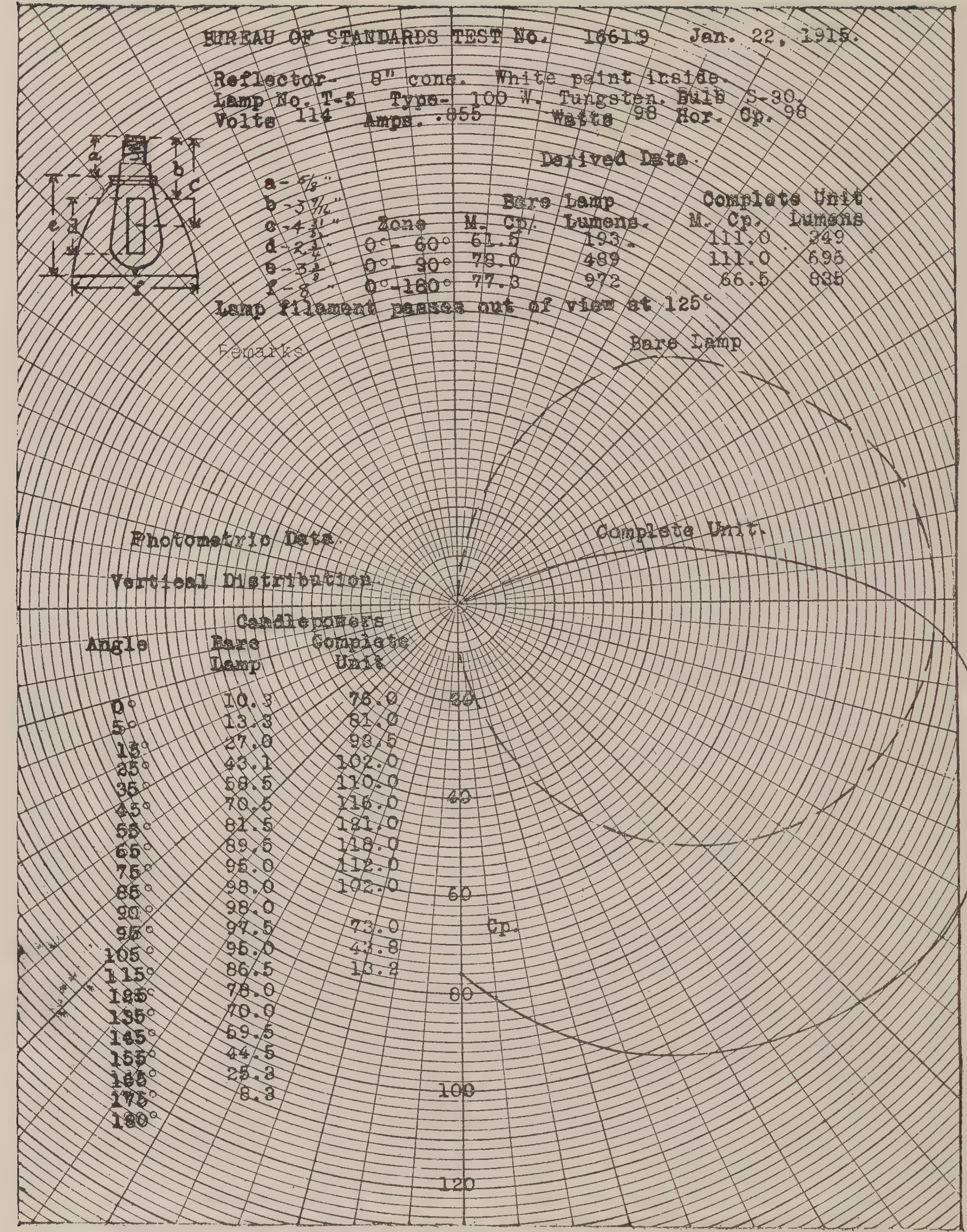
Remarks

Photometric Data.

Vertical Distribution.

	Candlepowers	
Angle	Bare Lamp	Complete Unit
0°	10.1	51.0
5°	9.9	52.0
15°	14.6	60.0
25°	24.3	62.0
35°	32.1	64.0
45°	40.1	67.0
55°	46.4	68.5
65°	52.0	67.0
75°	53.9	64.5
85°	55.6	56.5
90°	55.0	
95°	53.8	35.1
105°	52.4	12.8
115°	47.2	.2
125°	42.6	
135°	37.3	
145°	31.0	
155°	21.7	
165°	11.6	
175°	5.0	
180°		

FIG. 22.—Distribution curve of reflector C-8 and 60-watt tungsten lamp (large bulb).



BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector- 8" cone. White paint inside.
Lamp No. T-5 Type- 100 W. Tungsten. Bulb S-30.
Volts 114 Amps. .855 Watts 98 Hor. Cp. 98

Derived Data.

a- 5/8"
b- 3 9/16"
c- 4 31/32"
d- 2 1/4"
e- 3 1/8"
f- 8"

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens.	Complete Unit M. Cp.	Complete Unit Lumens
0°- 60°	61.5	193.	111.0	349
0°- 90°	78.0	489	111.0	695
0°-180°	77.3	972	66.5	835

Lamp filament passes out of view at 125°

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	10.3	76.0
5°	13.3	81.0
15°	27.0	93.5
25°	43.1	102.0
35°	58.5	110.0
45°	70.5	116.0
55°	81.5	121.0
65°	89.5	118.0
75°	95.0	112.0
85°	98.0	102.0
90°	98.0	
95°	97.5	73.0
105°	95.0	43.8
115°	86.5	13.2
125°	78.0	
135°	70.0	
145°	59.5	
155°	44.5	
165°	25.3	
175°	8.3	
180°		

FIG. 23.—Distribution curve of reflector C-8 and 100-watt tungsten lamp.

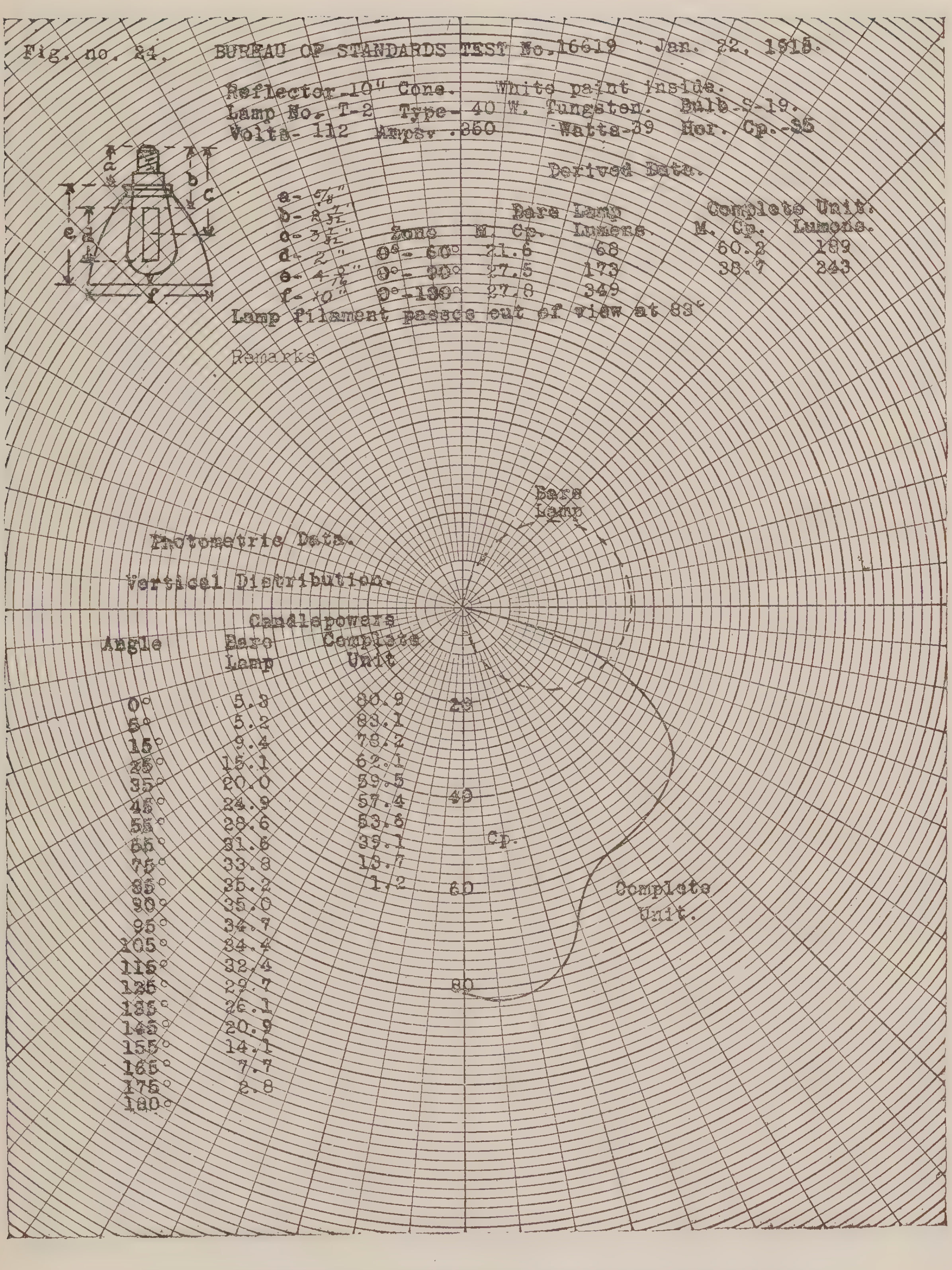


Fig. no. 24. BUREAU OF STANDARDS TEST No.16619 Jan. 22, 1915.

Reflector-10" Cone. White paint inside.
Lamp No. T-2 Type- 40 W. Tungsten. Bulb-S-19.
Volts- 112 Amps. .350 Watts-39 Hor. Cp.-35

a- 5/8"
b- 2 7/32"
c- 3 7/32"
d- 2"
e- 4 5/16"
f- 10"

Derived Data.

	Bare Lamp		Complete Unit.	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0°- 60°	21.6	68	60.2	189
0°- 90°	27.5	173	38.7	243
0°-180°	27.8	349		

Lamp filament passes out of view at 83°

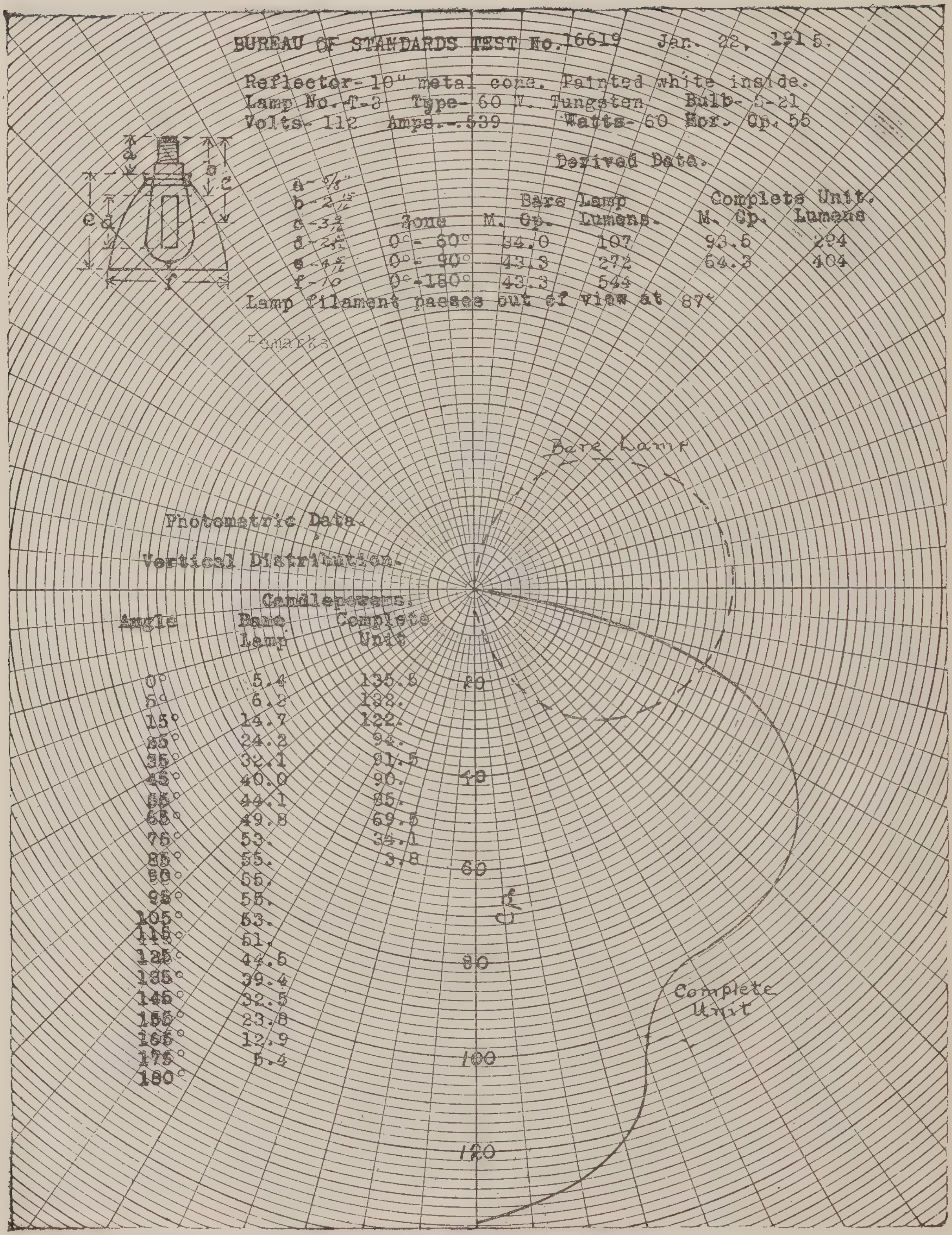
Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	5.3	80.9
5°	5.2	83.1
15°	9.4	78.2
25°	15.1	62.1
35°	20.0	59.5
45°	24.9	57.4
55°	28.6	53.6
65°	31.6	39.1
75°	33.8	13.7
85°	35.2	1.2
90°	35.0	
95°	34.7	
105°	34.4	
115°	32.4	
125°	29.7	
135°	26.1	
145°	20.9	
155°	14.1	
165°	7.7	
175°	2.8	
180°		

FIG. 24.—Distribution curve of reflector C-10 and 40-watt tungsten lamp.



BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector- 10" metal cone. Painted white inside.
Lamp No.-T-3 Type- 60 W. Tungsten Bulb- S-21
Volts- 112 Amps.-.539 Watts- 60 Hor. Cp. 55

a - 5/8"
b - $2\frac{15}{16}$
c - $3\frac{9}{16}$
d - $2\frac{5}{32}$
e - $4\frac{5}{16}$
f - 10

Derived Data.

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens	Complete Unit M. Cp.	Complete Unit Lumens
0° - 60°	34.0	107	93.6	294
0° - 90°	43.3	272	64.3	404
0° - 180°	43.3	544		

Lamp filament passes out of view at 87°

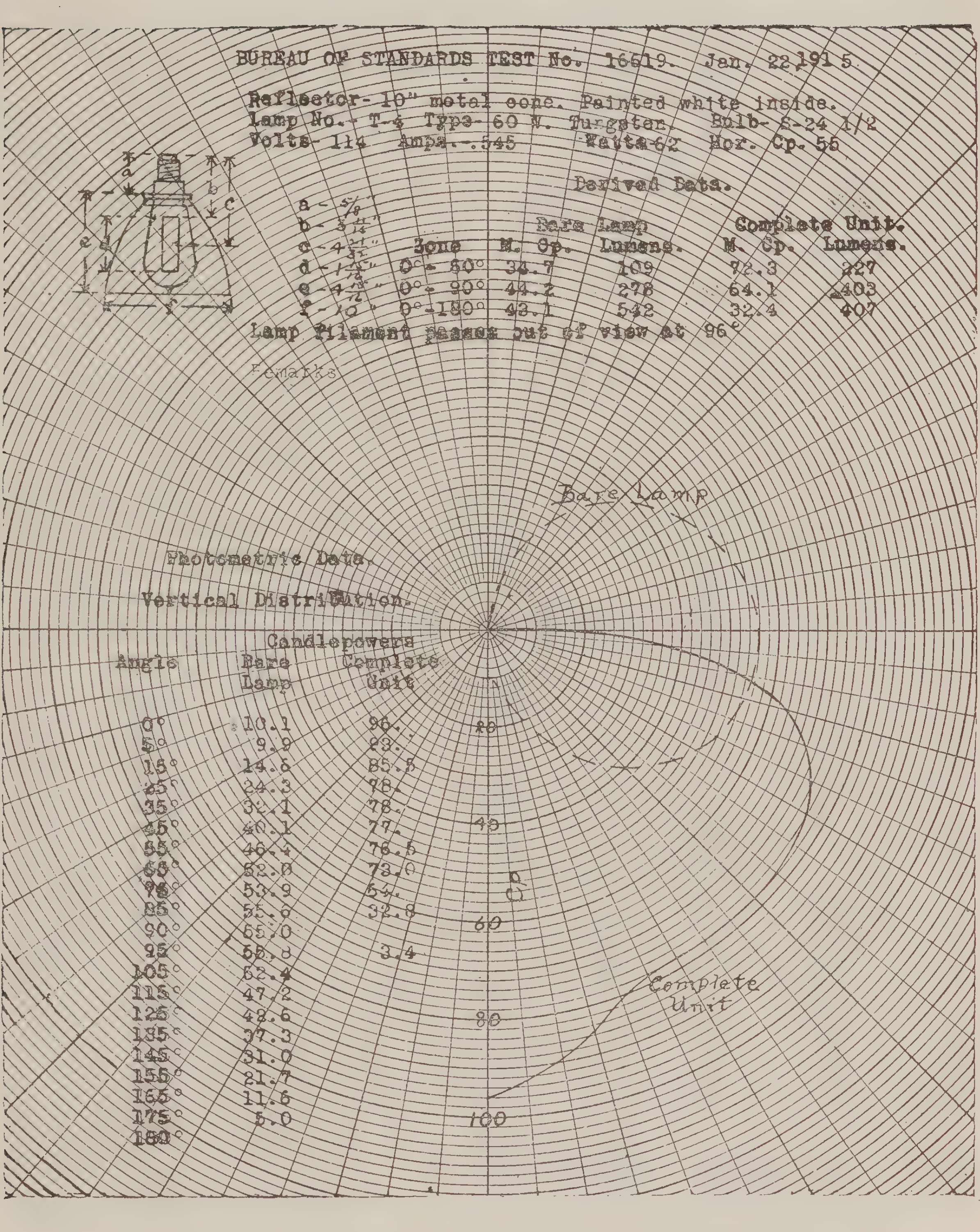
Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers. Bare Lamp	Candlepowers. Complete Unit
0°	5.4	135.8
5°	6.2	138.
15°	14.7	122.
25°	24.2	94.
35°	32.1	91.5
45°	40.0	90.
55°	44.1	85.
65°	49.8	69.5
75°	53.	32.1
85°	55.	3.8
90°	55.	
95°	55.	
105°	53.	
115°	51.	
125°	44.5	
135°	39.4	
145°	32.5	
155°	23.8	
165°	12.9	
175°	5.4	
180°		

FIG. 25.—Distribution curve of reflector C-10 and 60-watt tungsten lamp (large bulb).



BUREAU OF STANDARDS TEST No. 16619. Jan. 22 1915

Reflector- 10" metal cone. Painted white inside.
Lamp No.- T-4 Type- 60 W. Tungsten. Bulb- S-24 1/2
Volts- 114 Amps.- .545 Watts-62 Hor. Cp- 55

Derived Data.

a - 5/8"
b - 3 11/16"
c - 4 21/32"
d - 1 15/16"
e - 4 15/16"
f - 10"

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens.	Complete Unit. M. Cp.	Complete Unit. Lumens.
0°- 60°	34.7	109	72.3	227
0°- 90°	44.2	278	64.1	403
0°-180°	43.1	542	32.4	407

Lamp Filament passes out of view at 96°

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	10.1	96.
5°	9.9	93.
15°	14.6	85.5
25°	24.3	78.
35°	32.1	78.
45°	40.1	77.
55°	46.4	76.5
65°	52.0	73.0
75°	53.9	54.
85°	55.6	32.8
90°	55.0	
95°	55.8	3.4
105°	52.4	
115°	47.2	
125°	42.6	
135°	37.3	
145°	31.0	
155°	21.7	
165°	11.6	
175°	5.0	
180°		

FIG. 26.—Distribution curve of reflector C-10 and 60-watt tungsten lamp (large bulb).

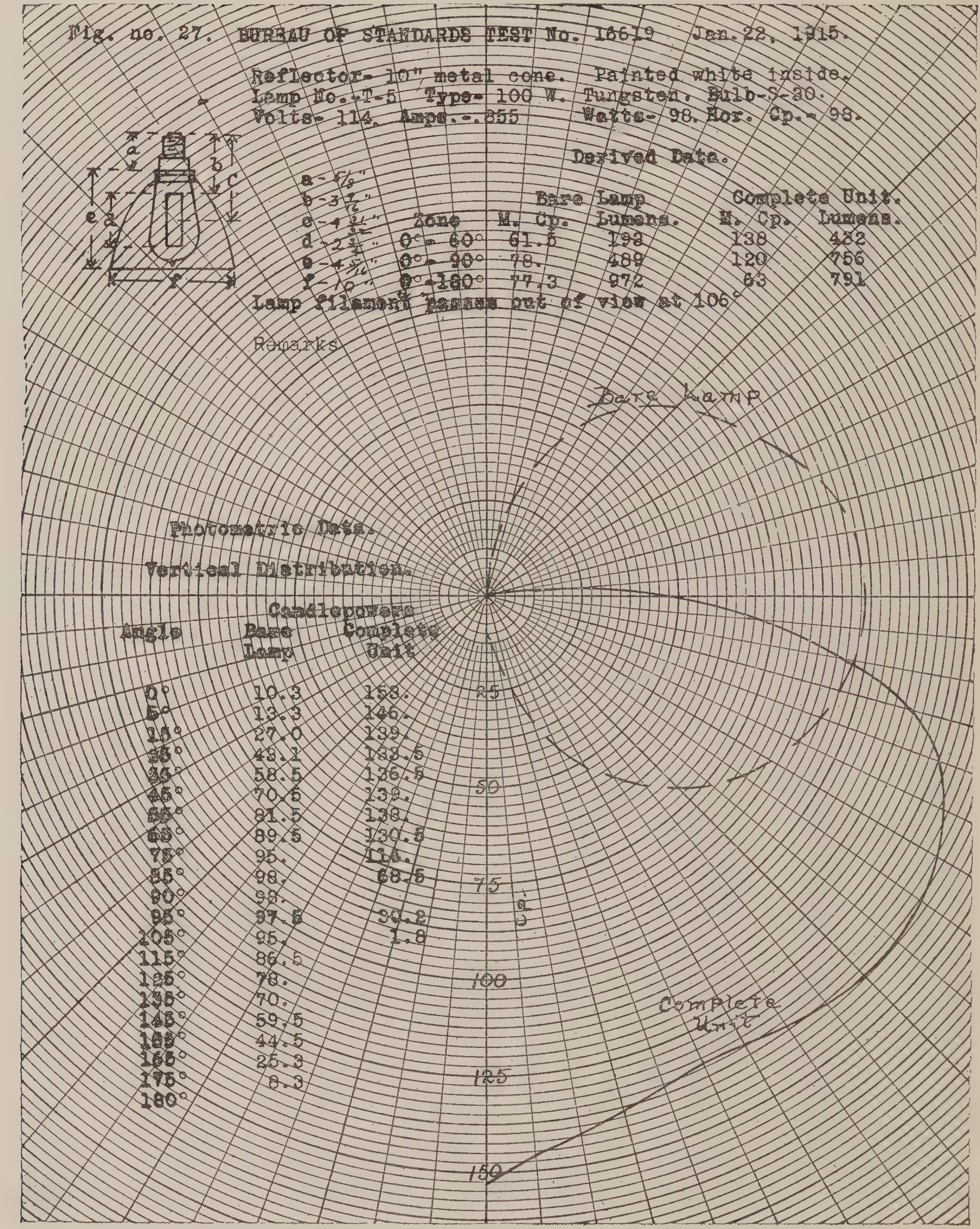


Fig. no. 27. BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector- 10" metal cone. Painted white inside.
Lamp No.-T-5 Type- 100 W. Tungsten. Bulb-S-30.
Volts- 114. Amps.-.855 Watts- 98. Hor. Cp.- 98.

a - 5/8"
b - 3 7/16"
c - 4 31/32"
d - 2 3/4"
e - 4 5/16"
f - 10"

Derived Data.

	Bare Lamp		Complete Unit.	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0° - 60°	61.5	193	138	432
0° - 90°	78.	489	120	756
0° - 180°	77.3	972	63	791

Lamp filament passes out of view at 106°

Remarks.

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	10.3	153.
5°	13.3	146.
15°	27.0	139.
25°	43.1	133.5
35°	58.5	136.5
45°	70.5	139.
55°	81.5	138.
65°	89.5	130.5
75°	95.	114.
85°	98.	68.5
90°	99.	
95°	97.5	30.2
105°	95.	1.8
115°	86.5	
125°	78.	
135°	70.	
145°	59.5	
155°	44.5	
165°	25.3	
175°	8.3	
180°		

FIG. 27.—Distribution curve of reflector C-10 and 100-watt tungsten lamp.

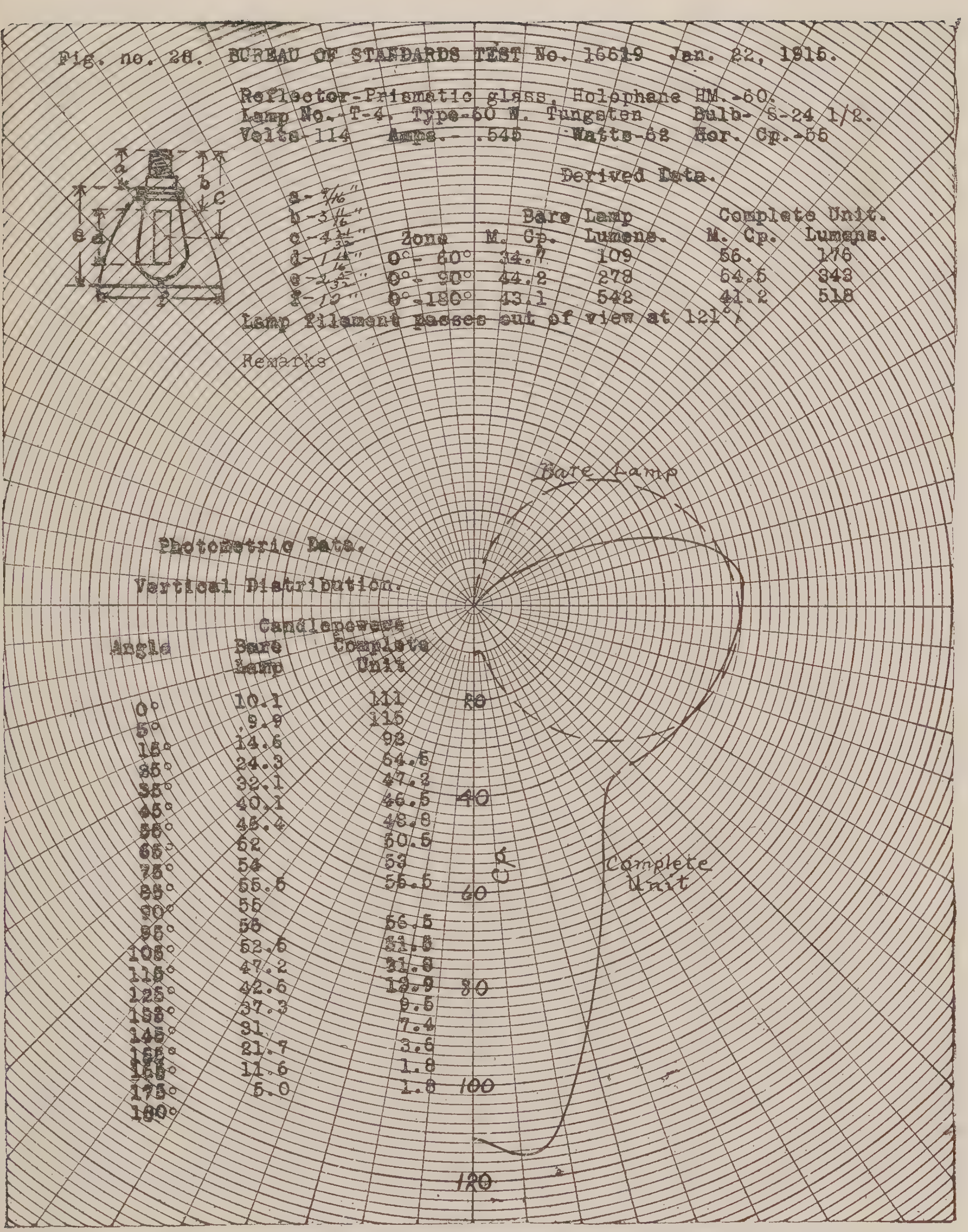


Fig. no. 28. BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector-Prismatic glass, Holophane HM.-60.
Lamp No.-T-4. Type-60 W. Tungsten Bulb- S-24 1/2.
Volts-114 Amps.- .545 Watts-52 Hor. Cp.-55

a-9/16"
b-3 11/16"
c-4 21/32"
d-1 1/16"
e-2 5/32"
f-12"

Derived Data.

	Bare Lamp		Complete Unit.	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0°- 60°	34.7	109	56.	176
0°- 90°	44.2	278	54.5	343
0°-180°	43.1	542	41.2	518

Lamp Filament passes out of view at 121°.

Remarks

Photometric Data.

Vertical Distribution.

	Candlepowers	
Angle	Bare Lamp	Complete Unit
0°	10.1	111
5°	9.9	115
15°	14.6	93
25°	24.3	64.5
35°	32.1	47.2
45°	40.1	46.5
55°	46.4	48.8
65°	52	50.6
75°	54	53
85°	55.5	55.5
90°	55	
95°	56	56.5
105°	52.6	51.6
115°	47.2	31.8
125°	42.6	13.9
135°	37.3	9.5
145°	31	7.4
155°	21.7	3.6
165°	11.6	1.8
175°	5.0	1.8
180°		

FIG. 28.—Distribution curve of reflector HM-60 and 60-watt tungsten lamp (large bulb).

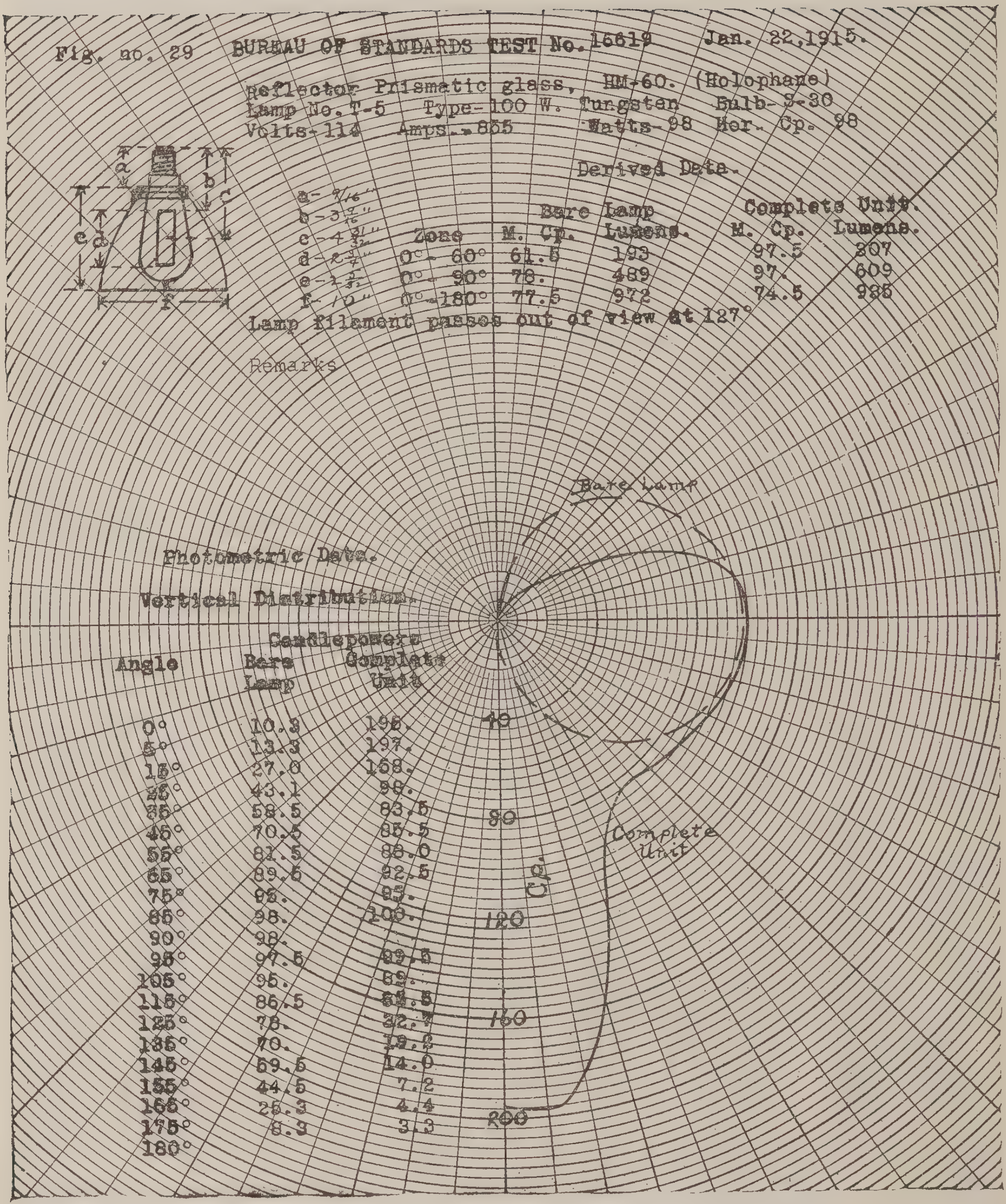


Fig. no. 29 BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector Prismatic glass, HM-60. (Holophane)
Lamp No. T-5 Type- 100 W. Tungsten Bulb- S-30
Volts- 114 Amps. .855 Watts- 98 Hor. Cp. 98

a- 9/16"
b- 3 9/16"
c- 4 31/32"
d- 2 3/4"
e- 1 5/32"
f- 10"

Derived Data.

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens.	Complete Unit. M. Cp.	Complete Unit. Lumens.
0° - 60°	61.5	193	97.5	307
0° - 90°	78.	489	97.	609
0° -180°	77.5	972	74.5	985

Lamp filament passes out of view at 127°

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepower Bare Lamp	Candlepower Complete Unit
0°	10.3	196.
5°	13.3	197.
15°	27.0	158.
25°	43.1	98.
35°	58.5	83.5
45°	70.5	85.5
55°	81.5	88.0
65°	89.5	92.5
75°	93.	95.
85°	98.	100.
90°	98.	
95°	97.5	99.5
105°	95.	89.
115°	86.5	61.5
125°	78.	32.7
135°	70.	19.2
145°	59.5	14.0
155°	44.5	7.2
165°	25.3	4.4
175°	8.3	3.3
180°		

FIG. 29.—Distribution curve of reflector HM-60 and 100-watt tungsten lamp.

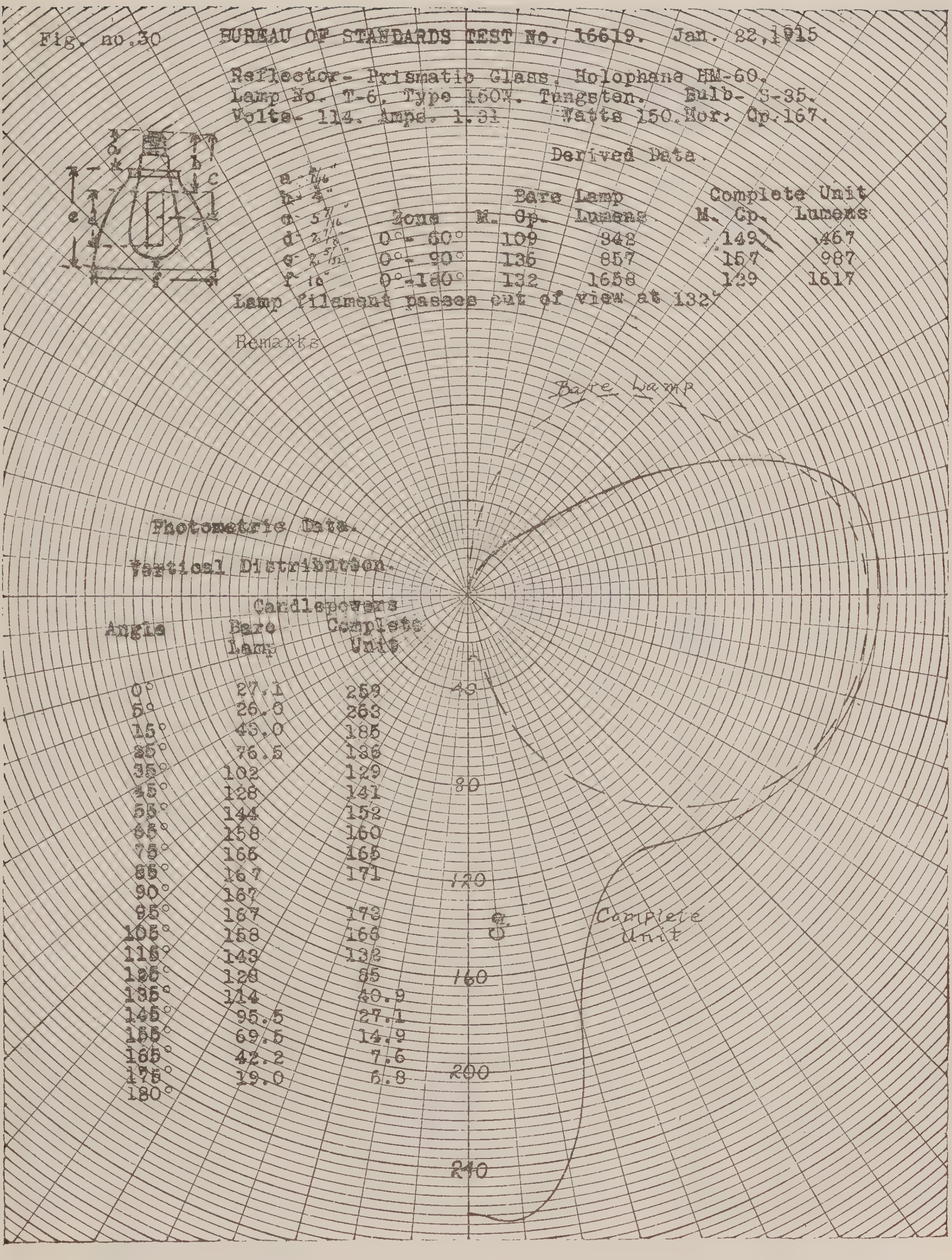


Fig. no.30 BUREAU OF STANDARDS TEST No. 16619. Jan. 22,1915

Reflector- Prismatic Glass. Holophane HM-60.
Lamp No. T-6. Type 150W. Tungsten. Bulb- S-35.
Volts- 114. Amps. 1.31 Watts 150. Hor. Cp. 167.

Derived Data.

a- 5/16"
b- 4"
c- 5 7/16"
d- 2 7/8"
e- 2 5/32"
f- 10"

	Bare Lamp		Complete Unit	
Zone	M. Cp.	Lumens	M. Cp.	Lumens
0°- 60°	109	342	149	467
0°- 90°	136	857	157	987
0°-180°	132	1658	129	1617

Lamp Filament passes out of view at 132°

Remarks

Photometric Data.

Vertical Distribution.

	Candlepowers	
Angle	Bare Lamp	Complete Unit
0°	27.1	259
5°	26.0	263
15°	43.0	185
25°	76.5	136
35°	102	129
45°	128	141
55°	144	152
65°	158	160
75°	166	165
85°	167	171
90°	167	
95°	167	173
105°	158	166
115°	143	132
125°	128	85
135°	114	40.9
145°	95.5	27.1
155°	69.5	14.9
165°	42.2	7.6
175°	19.0	6.8
180°		

Fig. 30.—Distribution curve of reflector HM-60 and 150-watt tungsten lamp.

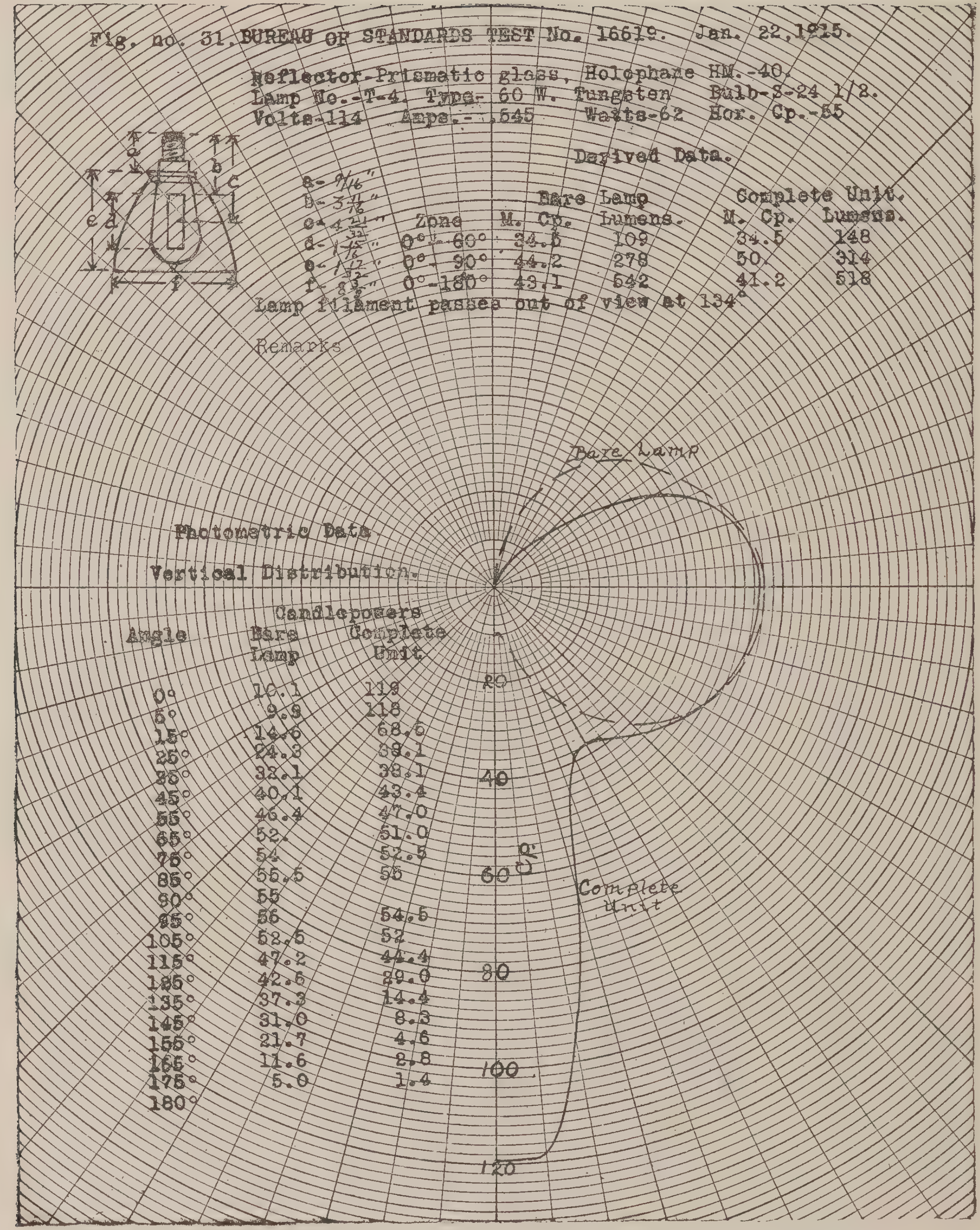


Fig. no. 31. BUREAU OF STANDARDS TEST No. 1661°. Jan. 22, 1915.

Reflector-Prismatic glass, Holophane HM.-40.
Lamp No.-T-4. Type- 60 W. Tungsten Bulb-S-24 1/8.
Volts-114 Amps.- .545 Watts-62 Hor. Cp.-55

Derived Data.

a- 9/16"
b- 3 1/16"
c- 4 21/32"
d- 1 15/16"
e- 1 17/32"
f- 8 3/8"

	Bare Lamp		Complete Unit.	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0°-60°	34.5	109	34.5	148
0°-90°	44.2	278	50.	314
0°-180°	43.1	542	41.2	518

Lamp filament passes out of view at 134°

Remarks

Photometric Data

Vertical Distribution.

	Candlepowers	
Angle	Bare Lamp	Complete Unit
0°	10.1	119
5°	9.9	118
15°	14.6	68.6
25°	24.3	38.1
35°	32.1	38.1
45°	40.1	43.4
55°	46.4	47.0
65°	52.	51.0
75°	54	52.5
85°	55.5	56
90°	55	
95°	56	54.6
105°	52.5	52
115°	47.2	44.4
125°	42.6	29.0
135°	37.3	14.4
145°	31.0	8.3
155°	21.7	4.6
165°	11.6	2.8
175°	5.0	1.4
180°		

FIG. 31.—Distribution curve of reflector HM-40 and 60-watt tungsten lamp (large bulb).

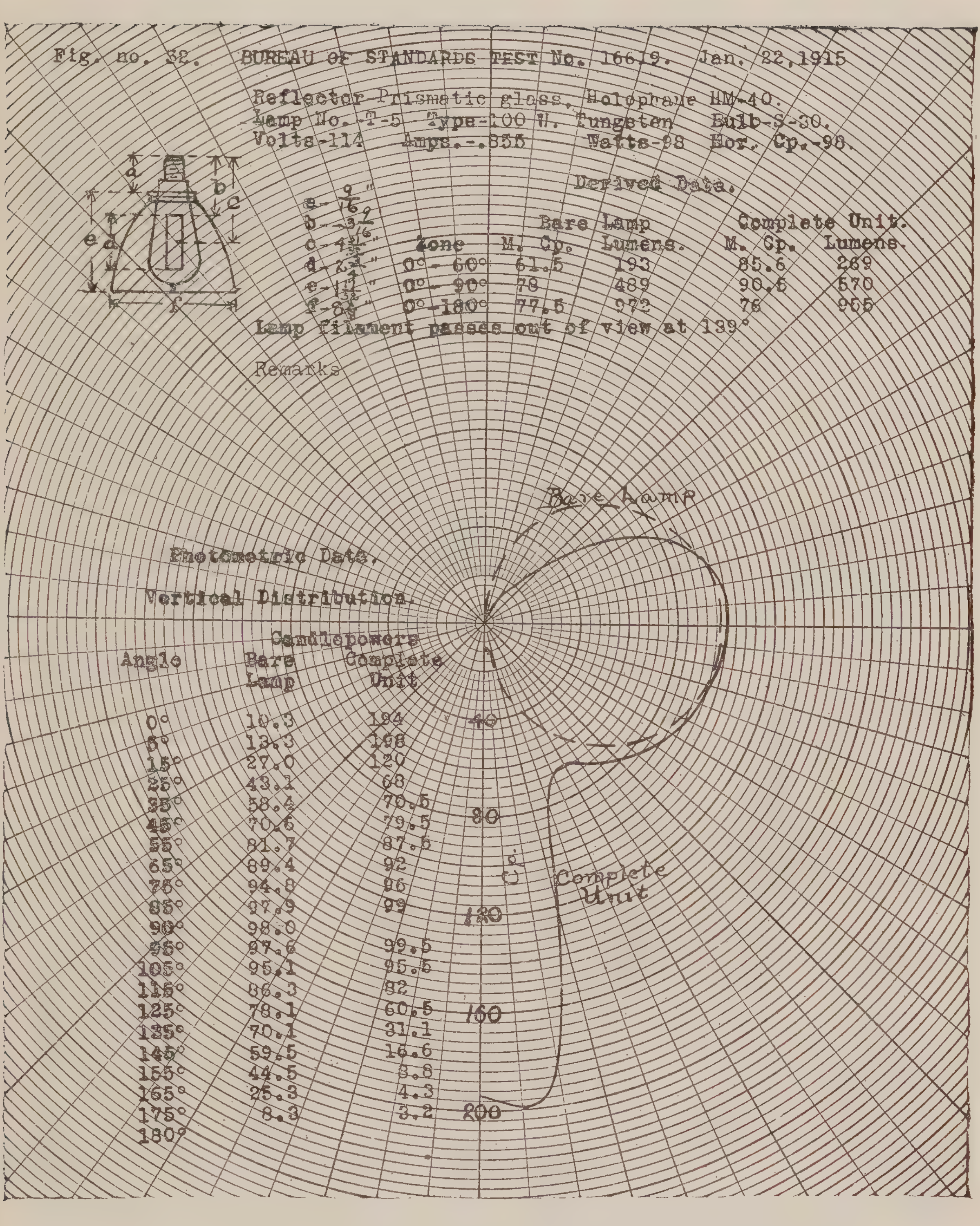


Fig. no. 32. BUREAU OF STANDARDS TEST No. 16619. Jan. 22, 1915

Reflector-Prismatic glass, Holophane HM-40.
Lamp No. T-5 Type-100 W. Tungsten Bulb-S-30.
Volts-114 Amps.-.855 Watts-98 Hor. Cp.-98.

a-$\frac{9}{16}$"
b-$3\frac{9}{16}$"
c-$4\frac{21}{32}$"
d-$2\frac{3}{4}$"
e-$1\frac{17}{32}$"
f-$8\frac{3}{4}$"

Derived Data.

	Bare Lamp		Complete Unit.	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0° - 60°	61.5	193	85.6	269
0° - 90°	78	489	90.5	570
0° -180°	77.5	972	76	955

Lamp filament passes out of view at 139°

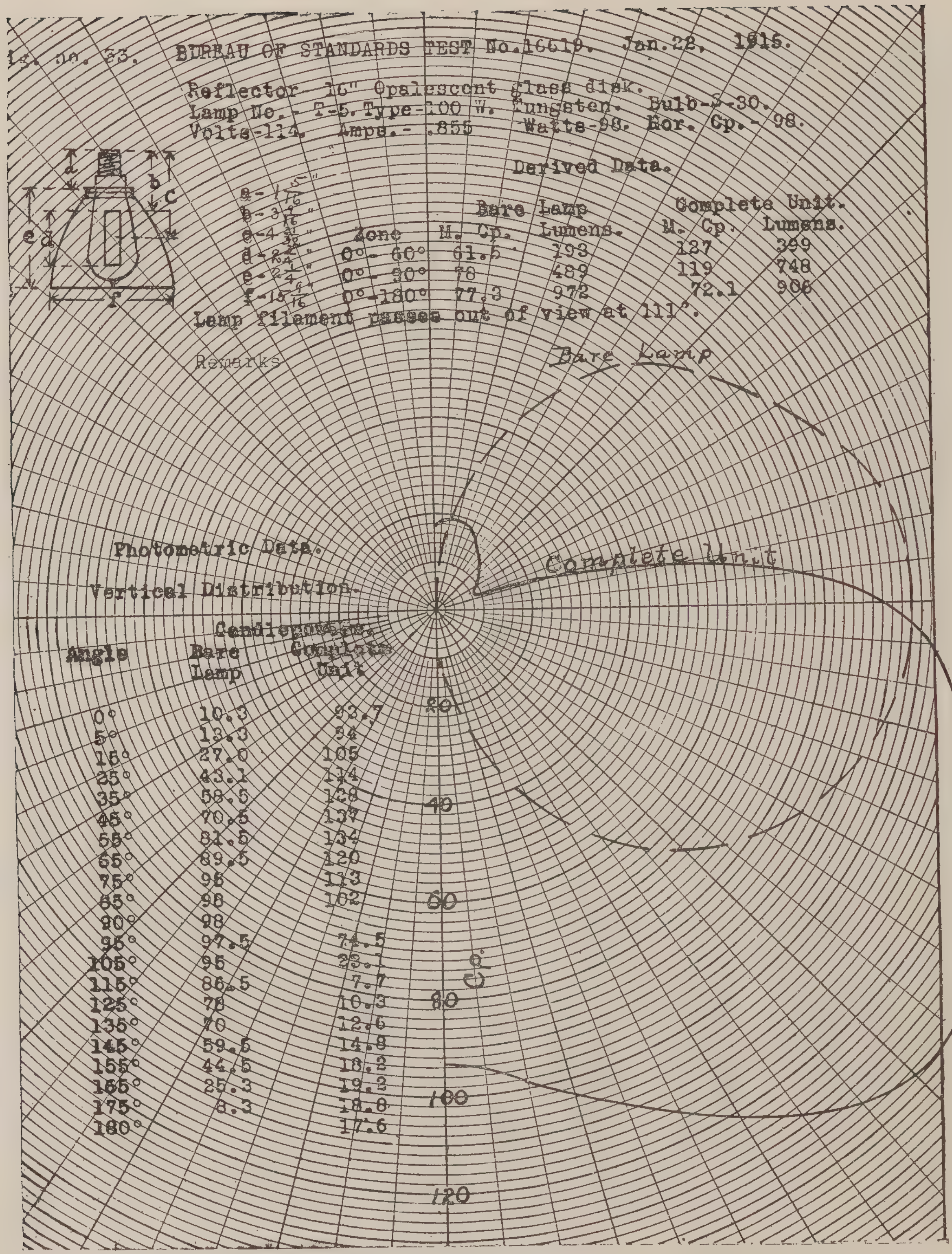
Remarks

Photometric Data.

Vertical Distribution.

	Candlepowers	
Angle	Bare Lamp	Complete Unit
0°	10.3	194
5°	13.3	198
15°	27.0	120
25°	43.1	68
35°	58.4	70.5
45°	70.6	79.5
55°	81.7	87.5
65°	89.4	92
75°	94.8	96
85°	97.9	99
90°	98.0	
95°	97.6	99.5
105°	95.1	95.5
115°	86.3	82
125°	78.1	60.5
135°	70.1	31.1
145°	59.5	16.6
155°	44.5	8.8
165°	25.3	4.3
175°	8.3	3.2
180°		

FIG. 32.—Distribution curve of reflector HM-40 and 100-watt tungsten lamp.



ig. no. 33. BUREAU OF STANDARDS TEST No.16619. Jan.22, 1915.

Reflector- 16" Opalescent glass disk.
Lamp No. - T-5. Type-100 W. Tungsten. Bulb-S-30.
Volts-114. Amps.- .855 Watts-98. Hor. Cp.- 98.

a-1 5/16"
b-3 7/16"
c-4 3/32"
d-2 3/4"
e-2 1/4"
f-15 9/16"

Derived Data.

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens.	Complete Unit. M. Cp.	Complete Unit. Lumens.
0° - 60°	61.5	193	127	399
0° - 90°	78	489	119	748
0°-180°	77.3	972	72.1	906

Lamp filament passes out of view at 111°.

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepower. Bare Lamp	Candlepower. Complete Unit
0°	10.3	93.7
5°	13.3	94
15°	27.0	105
25°	43.1	114
35°	58.5	128
45°	70.5	137
55°	81.5	134
65°	89.5	120
75°	95	113
85°	98	102
90°	98	
95°	97.5	74.5
105°	95	23.1
115°	86.5	7.7
125°	78	10.3
135°	70	12.6
145°	59.5	14.8
155°	44.5	18.2
165°	25.3	19.2
175°	8.3	18.8
180°		17.6

FIG. 33.—Distribution curve of reflector D-16 and 100-watt tungsten lamp.

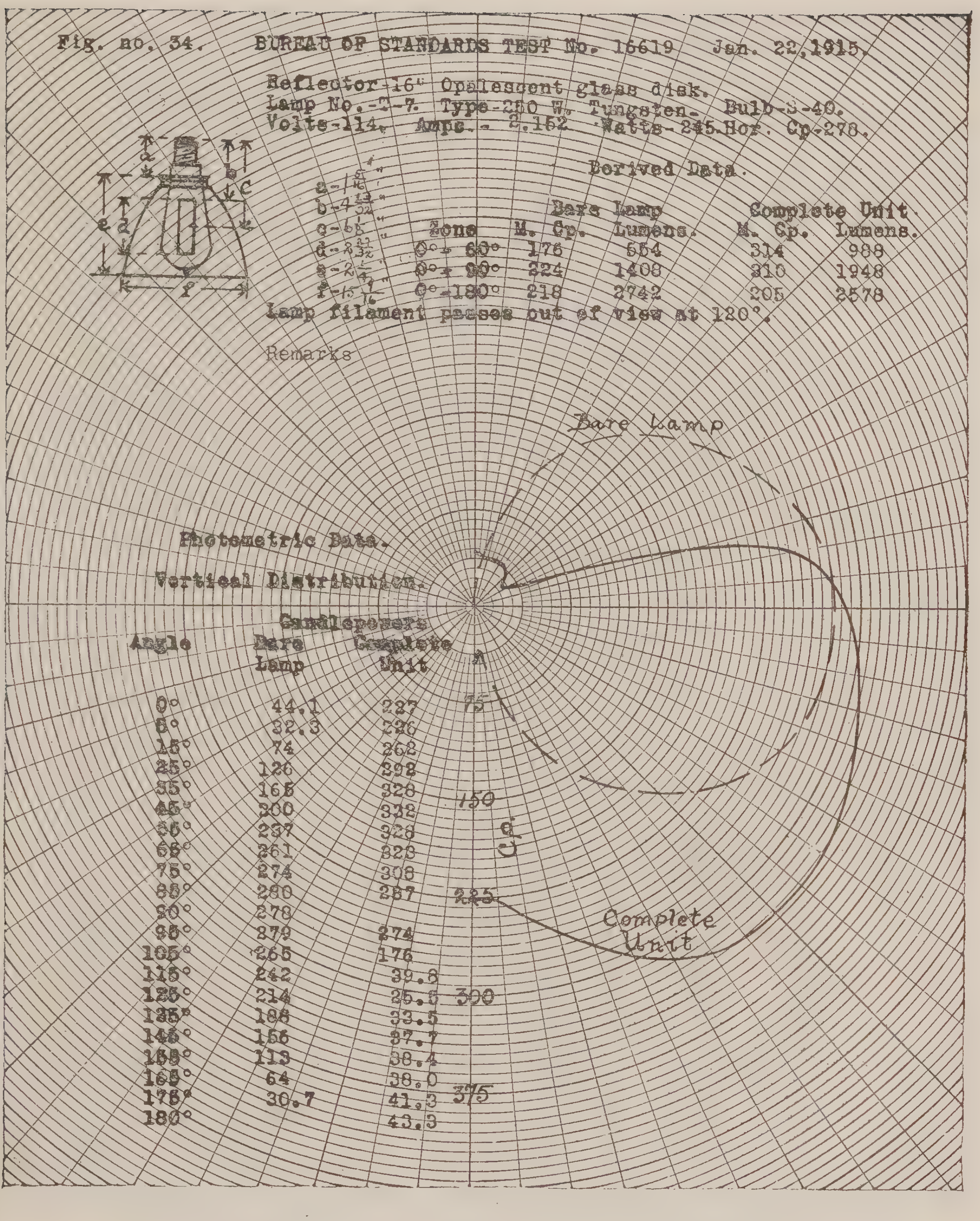


Fig. no. 34. BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915.

Reflector-16" Opalescent glass disk.
Lamp No.-T-7. Type-250 W. Tungsten- Bulb-S-40.
Volts-114. Amps.- 2.162 Watts-245. Hor. Cp-278.

a-1 5/16"
b-4 13/32"
c-6 1/8"
d-3 11/32"
e-2 1/4"
f-15 7/16"

Derived Data.

	Bare Lamp		Complete Unit	
Zone	M. Cp.	Lumens.	M. Cp.	Lumens.
0°- 60°	176	554	314	988
0°- 90°	224	1408	310	1948
0°-180°	218	2742	205	2578

Lamp filament passes out of view at 120°.

Remarks

Photometric Data.

Vertical Distribution.

	Candlepowers	
Angle	Bare Lamp	Complete Unit
0°	44.1	227
5°	32.3	226
15°	74	262
25°	126	292
35°	165	328
45°	200	332
55°	237	328
65°	261	323
75°	274	308
85°	280	287
90°	278	
95°	279	274
105°	265	176
115°	242	39.8
125°	214	25.5
135°	188	33.5
145°	156	37.7
155°	113	38.4
165°	64	38.0
175°	30.7	41.3
180°		43.3

FIG. 34.—Distribution curve of reflector D-16 and 250-watt tungsten lamp.

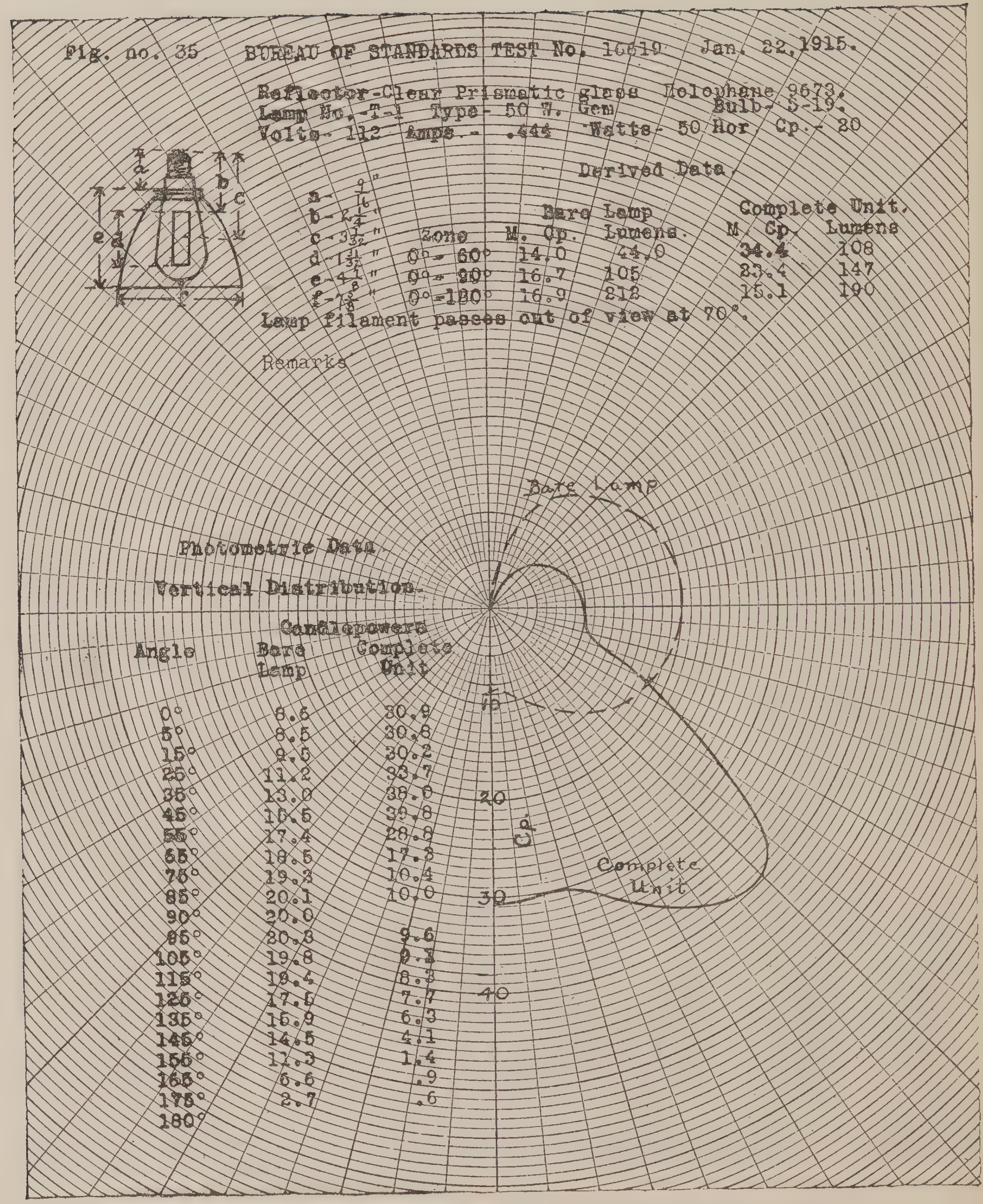


Fig. no. 35 BUREAU OF STANDARDS TEST No. 10619 Jan. 22, 1915.

Reflector-Clear Prismatic glass Holophane 9673. Bulb- S-19.
Lamp No. -T-1 Type- 50 W. Gem
Volts- 112 Amps. - .444 Watts- 50 Hor. Cp. - 20

a - $\frac{9}{16}$"
b - $2\frac{1}{4}$"
c - $3\frac{7}{32}$"
d - $1\frac{31}{32}$"
e - $4\frac{1}{8}$"
f - $7\frac{3}{8}$"

Derived Data.

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens.	Complete Unit. M. Cp.	Complete Unit. Lumens
0° - 60°	14.0	44.0	34.4	108
0° - 90°	16.7	105	23.4	147
0° - 180°	16.9	212	15.1	190

Lamp filament passes out of view at 70°.

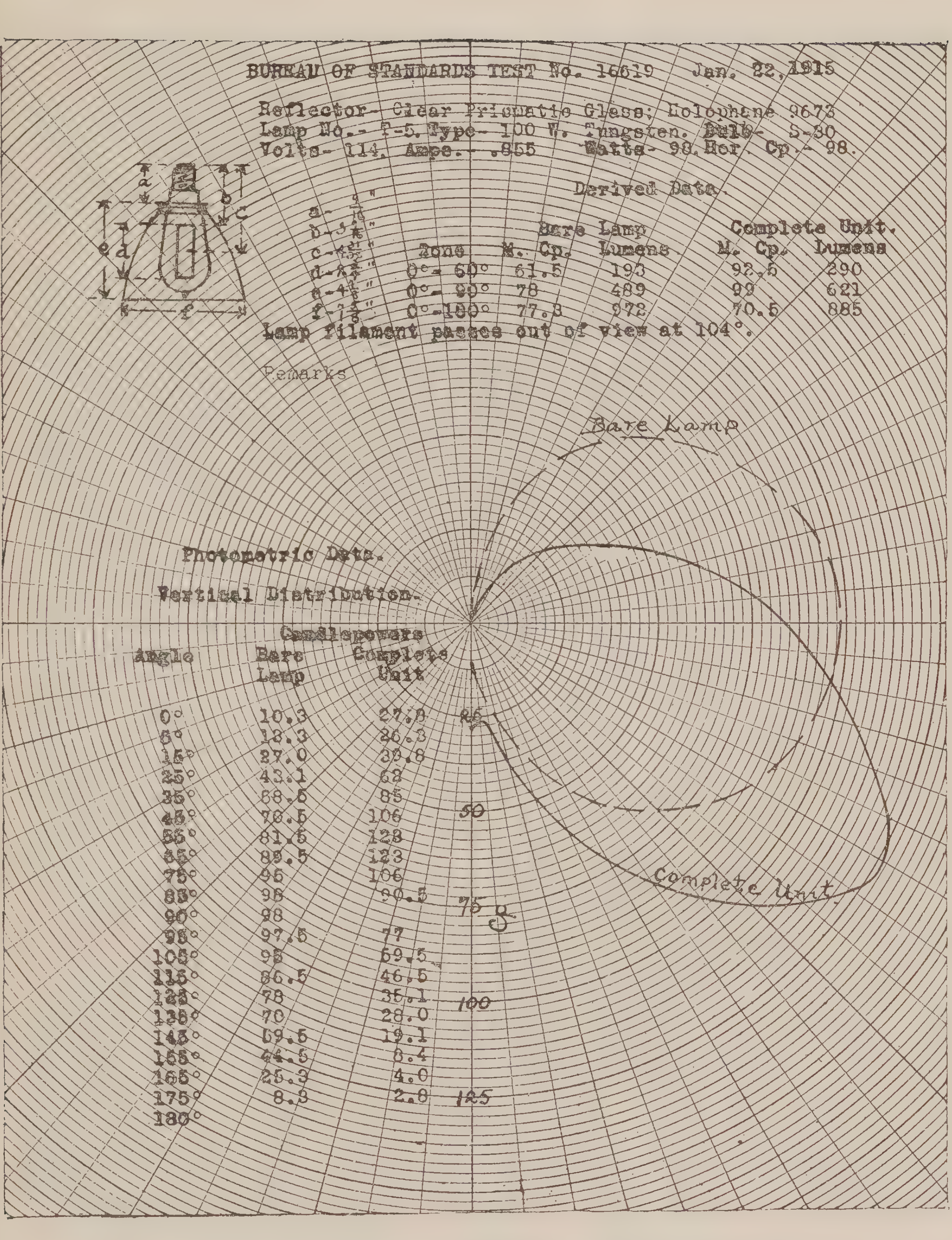
Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	8.6	30.9
5°	8.5	30.8
15°	9.5	30.2
25°	11.2	33.7
35°	13.0	38.0
45°	15.5	39.8
55°	17.4	28.8
65°	18.5	17.3
75°	19.3	10.4
85°	20.1	10.0
90°	20.0	
95°	20.3	9.6
105°	19.8	9.1
115°	19.4	8.3
125°	17.5	7.7
135°	15.9	6.3
145°	14.5	4.1
155°	12.3	1.4
165°	6.6	.9
175°	2.7	.6
180°		

FIG. 35.—Distribution curve of reflector H-9673 and 50-watt gem lamp.



BUREAU OF STANDARDS TEST No. 16619 Jan. 22, 1915

Reflector- Clear Prismatic Glass; Holophane 9673
Lamp No.- T-5, Type- 100 W. Tungsten. Bulb- S-30
Volts- 114. Amps.- .855 Watts- 98. Hor. Cp.- 98.

a- 9/16"
b-3 1/16"
c-4 21/32"
d-3 3/4"
e-4 1/8"
f-7 3/8"

Derived Data.

Zone	Bare Lamp M. Cp.	Bare Lamp Lumens	Complete Unit. M. Cp.	Complete Unit. Lumens
0°- 60°	61.5	193	92.5	290
0°- 90°	78	489	99	621
0°-180°	77.3	972	70.5	885

Lamp filament passes out of view at 104°.

Remarks

Photometric Data.

Vertical Distribution.

Angle	Candlepowers Bare Lamp	Candlepowers Complete Unit
0°	10.3	27.8
5°	13.3	26.3
15°	27.0	39.8
25°	43.1	62
35°	68.5	85
45°	78.5	106
55°	81.5	128
65°	89.5	123
75°	95	106
85°	96	90.5
90°	98	
95°	97.5	77
105°	95	59.5
115°	86.5	46.5
125°	78	35.1
135°	70	28.0
145°	59.5	19.1
155°	44.5	8.4
165°	25.3	4.0
175°	8.3	2.8
180°		

FIG. 36.—Distribution curve of reflector H-9673 and 100-watt tungsten lamp.

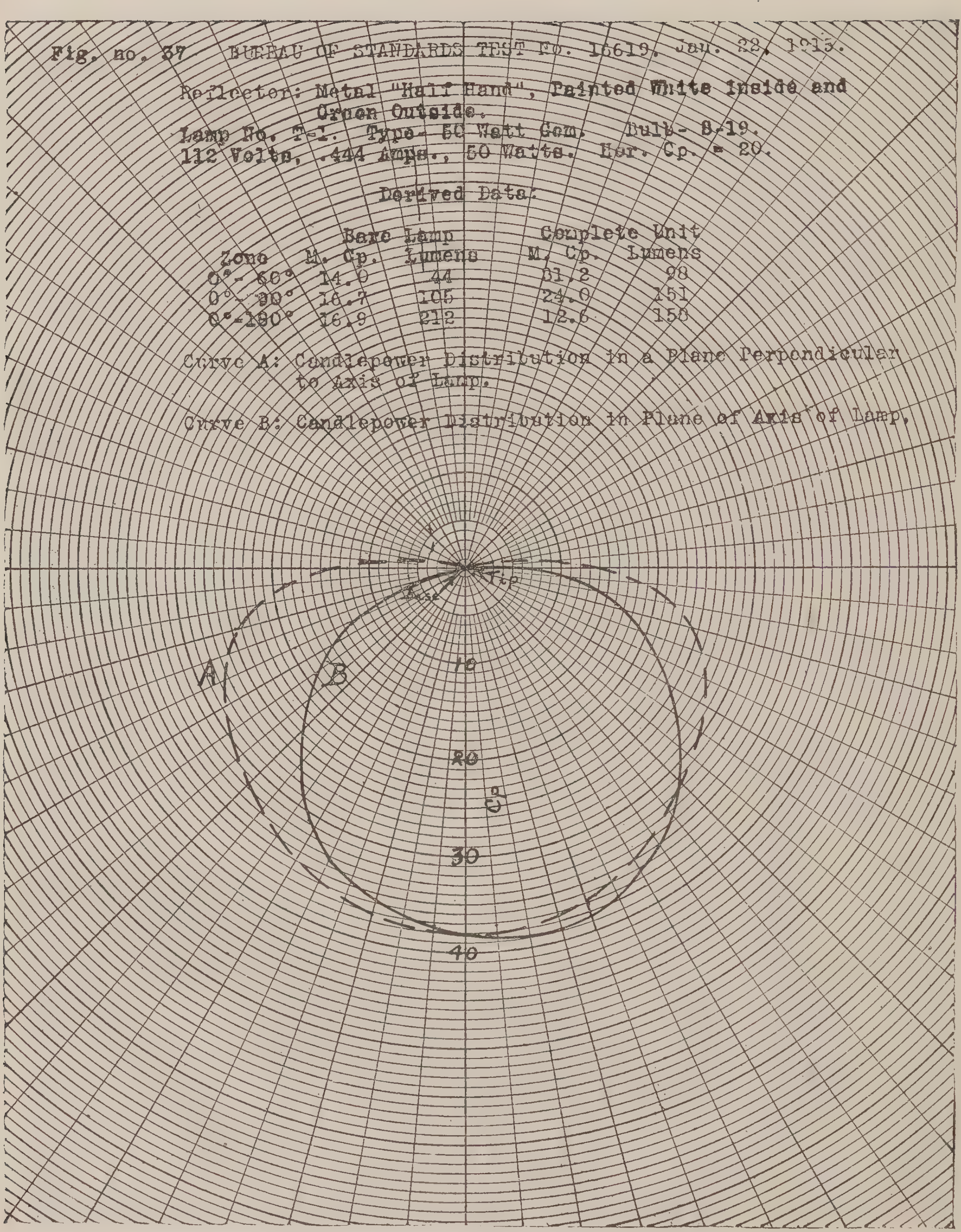


Fig. no. 37 BUREAU OF STANDARDS TEST No. 16619. Jan. 22, 1915.

Reflector: Metal "Half Hand", Painted White Inside and Green Outside.

Lamp No. T-1. Type- 50 Watt Gem. Bulb- S-19.
112 Volts, .444 Amps., 50 Watts. Hor. Cp. = 20.

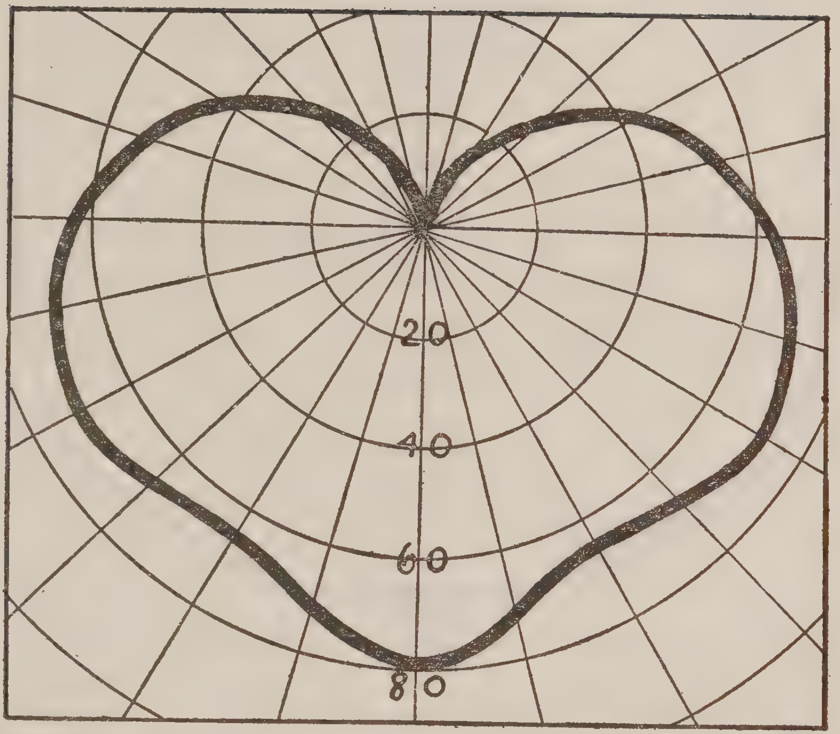
Derived Data.

	Bare Lamp		Complete Unit	
Zone	M. Cp.	Lumens	M. Cp.	Lumens
0°- 60°	14.0	44	31.2	98
0°- 90°	16.7	105	24.0	151
0°-180°	16.9	212	12.6	158

Curve A: Candlepower Distribution in a Plane Perpendicular to Axis of Lamp.

Curve B: Candlepower Distribution in Plane of Axis of Lamp.

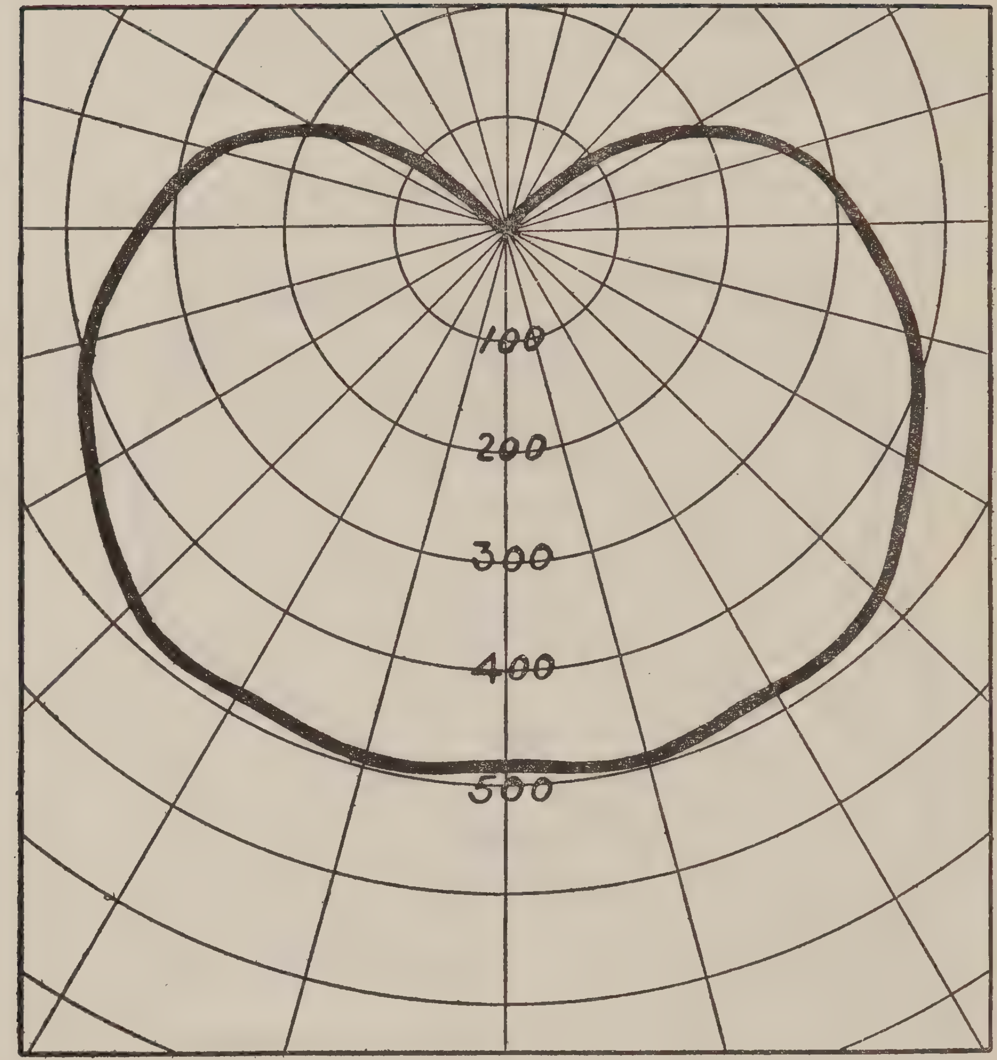
FIG. 37. Distribution curve of reflector ½ tien and 50-watt gem lamp.



PRESSURE 2.5"
CONSUMPTION CU. FT. 3.31
$J_{\triangle}$ 40.7 Lm 255.5
$J_{\triangledown}$ 68.8 Lm 432.5
$J_{\circ}$ 54.7 Lm 688.0
ZONE 0°–60°
J_{Δ} 69.2 Lm 217.4
WATER GAS CP. 21.9

READINGS BY WELSBACH CO.
MANTLE STANDARD
ACCESSORY 442 F.R. GLOBE
LAMP REFLEX

FIG. 38.—Distribution curve of opaline globe reflex lamp.



PRESSURE 2.5
CONSUMPTION CU.FT. 14.37
$J_{\frown}$ 172.3 Lm 1082.6
$J_{\smile}$ 432.5 Lm 2717.4
J_{o} 302.4 Lm 3800.0
ZONE 0°–60°
J_{Δ} 475.6 Lm 1494.1
WATER GAS C.P. 17.27

READINGS BY WELSBACH CO.
MANTLE STANDARD
ACCESSORY ~~~~
LAMP #1912 4 lt. INTENSO

FIG. 39.—Distribution curve of clear globe gas arc lamp.

Comment.—Sheet No. 7 shows a distribution curve for a proper reflector (reflector No. 3) and lamp, for use over cutting, basting, and pressing tables. It is seen from this curve that a large proportion of the light flux from the lamp is thrown downward.

No. 24 gives good distribution for use over cutting, basting, and pressing tables. The Gem lamp, however, with which this reflector was found combined in actual use, is not so economical as a tungsten lamp.

No. 26, the curve of the half, tin, reflector (reflector No. 8) would be a good curve provided the units were close to the work. It is usually used in connection with flexible conduit, which, during the survey, was found not to stand the rough usage it received from operators.

The remainder of the distribution curves show reflectors unsuited to illuminating conditions in workshops of the garment trades. They are reproduced with a view to showing the failure of such reflectors in combination with the lamps actually used to distribute the light flux in a useful direction for local illumination.

To the informed, a glance at these curves is sufficient to show the undesirability of such combinations of lamps and reflectors. As the significance of these curves may not be apparent to the layman, a brief discussion of the meaning of one of these curves (sheet 1) is therefore appended.

The dotted curve shows the mean candlepower of the lamp taken at different angles to its vertical axis. It is plain that no light is emitted directly over the base of the lamp where it is screwed into the socket. The candlepower in this position is, therefore, zero. The candlepower directly under the tip of the lamp will be low because of the small area of filament over this region. The maximum mean candlepower is found in a plane approximately perpendicular to the filament at its center.

The unbroken curve shows the apparent candlepower values of combined lamp and reflector taken at various angles to the axis of the lamp. For illumination purposes, however, the illumination of any area is not determined by the apparent candlepower of the source in any particular direction but by the total flux of light upon the area in question. To produce an illumination upon a working plane of 1 foot-candle, a light flux of 1 lumen per square foot of working plane is necessary. Now the intensity of any source of light or its candlepower is the light flux per unit of solid angle. We may, therefore, obtain the light flux or total number of lumens in any angular zone by multiplying the apparent candlepower of the source in that zone by the solid angle contained in the zone.

The following table (Table 1) gives the values of the solid angle in various zones:

TABLE 1.—*Solid angle value (in steradians) of various zones according to their angle from the vertical.*

Zone.	Angle.	Lumen factor.	Zone.	Angle.	Lumen factor.
0–10	5	0.0954	90–100	95	1.0910
10–20	15	.2834	100–110	105	1.0580
20–30	25	.4630	110–120	115	.9920
30–40	35	.6280	120–130	125	.8970
40–50	45	.7740	130–140	135	.7740
50–60	55	.8970	140–150	145	.6280
60–70	65	.9920	150–160	155	.4630
70–80	75	1.0580	160–170	165	.2834
80–90	85	1.0910	170–180	175	.0954

Thus in the diagram on sheet 1 the apparent average candlepower in the zone from 0–10° is 23.3. The solid angle contained in this zone is from the table 0.0954 steradians. The flux or number of lumens in this zone is, therefore, 23.3×0.0954 or 2.2 lumens. Passing now to the 100–110° zone (the zone 10–20° above the horizontal plane of the room, hence far removed from the working plane), the average candlepower is 14.1 and the contained solid angle is 1.058 steradians. The flux is, therefore, 14.1×1.058 or 14.9 lumens. We can not, therefore, obtain a correct idea of the distributing characteristics of a unit merely by considering the shape of the distribution curve owing to the variation in the solid angle content of the various zones.

Suppose now we try to determine the height at which the unit in question should be suspended (neglecting glare effects) in order to illuminate a cutting table 5 feet wide with an intensity of 5 foot-candles.

The area to be illuminated by the unit is a circle circumscribing a 5-foot square or 39.3 square feet. The flux of lumens required to produce an illumination of 5 foot-candles over this area is 39.3×5 or 196.5. Inasmuch as the total flux of lumens in the unit on sheet 1 is only 105 for the zones from 0 to 90° it is clear that it will be impossible to produce this uniform illumination on the working plane in question with this combination no matter how close the unit is suspended to the surface of the table.

Should the unit with the distribution curve shown in sheet No. 2 be used, the zone 0–50° contains 183 lumens, or very nearly what is needed. The height of suspension above the working plane, however, determined by the radius (3.5 feet) of the area to be illuminated, divided by the tangent of 50° (1.192) or approximately 3 feet, is so low that, at this height, workers would be subject to strong glare effects. Besides this 80 per cent of the total flux would be directed to parts of the room other than the working plane.

APPENDIX F.

PHOTOGRAPHS OF LIGHTING CONDITIONS WITH EXPLANATORY NOTES.

The following photographs (Plates X–XIV, Nos. 1–10) portray some of the conditions observed, as discussed, in the attached explanatory notes. It should be stated that all the photographs are flash-light photographs.

Photograph No. 1, shop No. 18, shows a typical arrangement of machines. In this shop there are 16 machines in one bank parallel to the north windows. The daylight illumination was measured at 12.05 p. m. on July 23, the sky being overcast. The sky angle of the room was approximately zero. The illumination found averaged 3.6 foot-candles with a maximum of 7.8 foot-candles and a minimum of 2 foot-candles. The windows faced on an alley. The opposite buildings were dark gray in color. The shop was on the second floor.

There were 16 outlets for artificial light with adjustable drop-cord suspension. Of the 16 outlets, less than one-third (31.2 per cent) would light. There were five units provided with 10-inch conical reflectors and 11 lamps with no reflectors. The units used were three 60-watt large bulb tungsten, one 50-watt Gem, and one 35-watt Gem lamp.

Photograph No. 2, shop No. 16, shows a typical arrangement of machines. In this shop there are 14 machines in the one bank shown parallel to the south windows. The daylight illumination was measured at 12.30 p. m. on July 22. The sky was clear with approximately 3 per cent cumulus clouds, the sky angle being approximately zero. The average daylight illumination was 0.2 foot-candle, with a maximum of 0.35 foot-candle and a minimum of 0.08 foot-candle. The windows faced on an alley. The opposite buildings were white in color. The shop was on the second floor.

There were 7 outlets for artificial light with adjustable drop-cord suspension. All of the 7 units would light. Of the 7 units, 6 were made up of 8-inch conical tin reflectors painted white inside, provided with 100-watt tungsten lamps and 1 similar reflector with a 60-watt large bulb lamp.

Artificial illumination was not used at all times. The average value of combined artificial and daylight illumination was 15 foot-candles, with a maximum of 25.5 and a minimum of 8.2 foot-candles. The average height of suspension was 0.75 foot and the angle of glare with attention concentrated at the needle point was 53°. This was reduced to practically zero when the worker lifted his head. The glare effect from the exposed portion of the lamp bulbs is evident.

Photograph No. 3, shop No. 10–c, shows a typical arrangement of machines using gas for artificial illumination. In this shop there were 12 machines in the one bank shown parallel to the north windows. The daylight illumination was measured at 12.30 p. m. on July 14. The sky was slightly overcast. The sky-angle was 85.5°.

The average daylight illumination was 41.2 foot-candles, with 62.5 foot-candles maximum and 17 foot-candles minimum. This shop was on the twelfth door.

There were 12 outlets for artificial light, 68.2 per cent of which would light. The units were of the flat flame, 6 cubic feet per hour, gas type, equipped with wire-basket screens. The height of the lights above the needle plane was 0.5 foot, and the angle of glare when the attention was concentrated at the needle point was 46°. While the good daylight illumination present reduces greatly the number of occasions on which artificial lighting will be necessary, it is evident that when this is employed the conditions are unsatisfactory.

Photograph No. 4, shop No. 32, shows a typical arrangement of machines in banks perpendicular to the north window. In this shop there are 4 machines per bank, with individual motor drive. The daylight illumination was measured at 10 a. m., August 12. The sky was clear, but the atmosphere was foggy. The sky angle was approximately zero. The illumination was 9.4 foot-candles average, 17 foot-candles maximum, and 4 foot-candles minimum. The windows faced an alley, and the opposite buildings were white and had been recently painted. The shop was on the third floor.

There were two outlets for lights on the four machines. The units consisted of two 100-watt tungsten lamps with no shades or reflectors. The average height of suspension was 1 foot, and the angle of glare when the attention was concentrated on the needle point was 60°.

Photograph No. 5, shop No. 11b, shows an arrangement of 5 finishing tables, in one of the better-class shops. The finishing tables are placed perpendicular to the south windows and in line with the machines. The daylight illumination was measured at 10.40 a. m., on July 16. The sky was clear with 50 per cent cumulus clouds. The sky angle was 57.5°. The illumination was 52 foot-candles average, 80-foot candles maximum, and 26-foot candles minimum. The windows faced on Twenty-sixth Street and the opposite buildings were white. The shop was on the Third floor.

There were 14 outlets for artificial lighting units, 93 per cent of which would light. Adjustable drop-cord suspension was used in

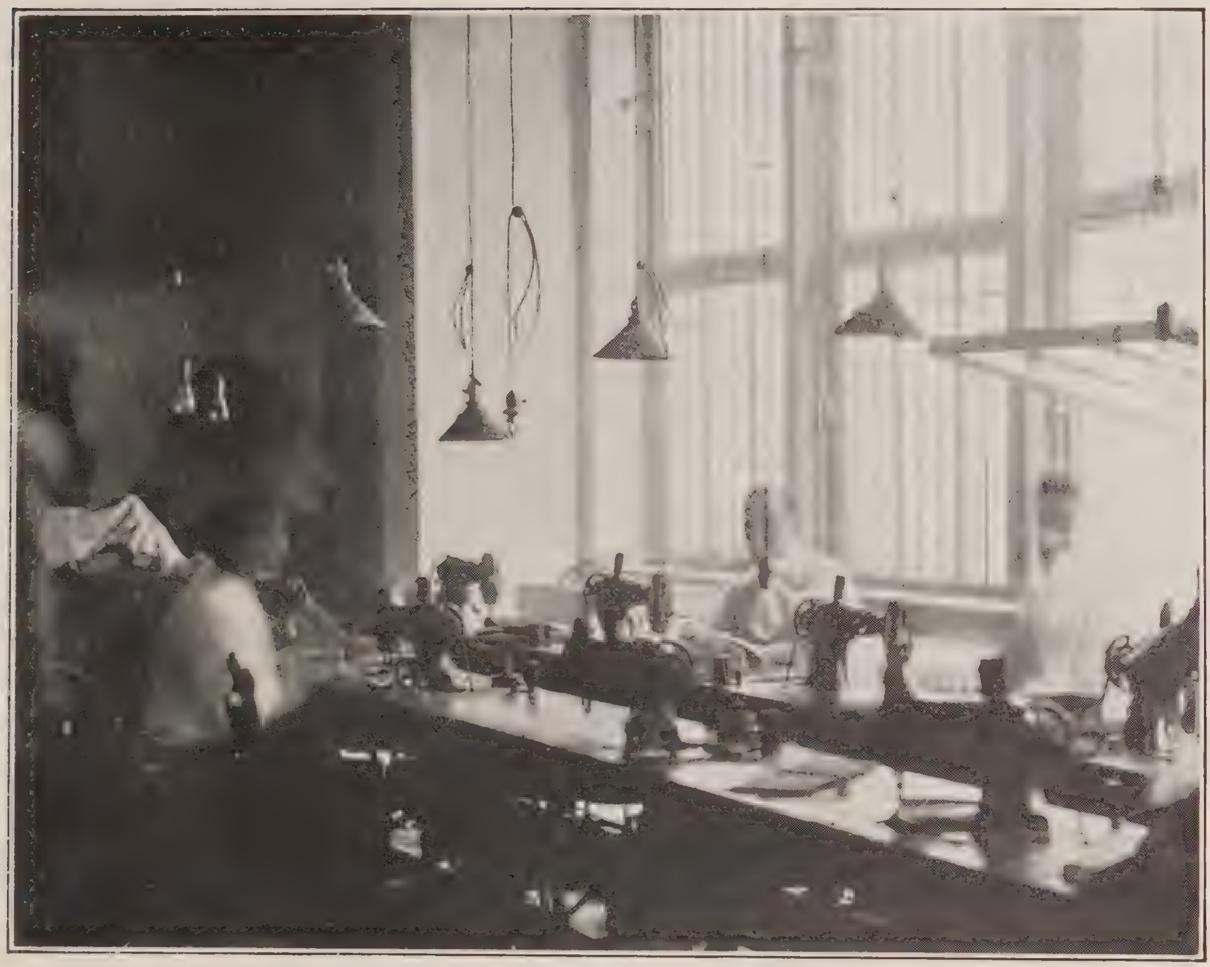


Fig. 1.—Machines, shop No. 18 (on first and second floors), showing poor lighting arrangement. (Note absence of lamps from reflectors.)

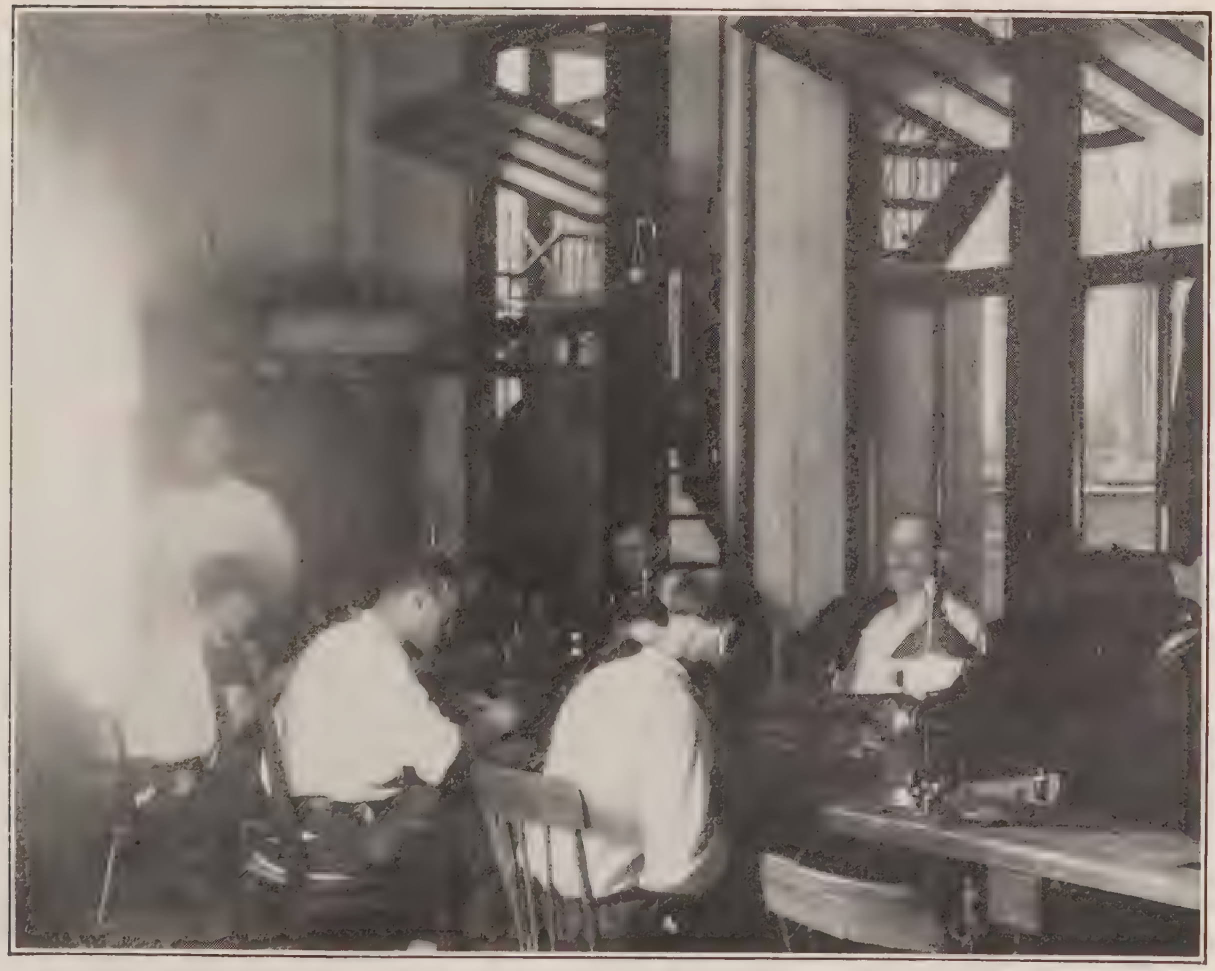


Fig. 2.—Glare effects from projecting filaments and low suspension in a shop with poor daylight illumination.

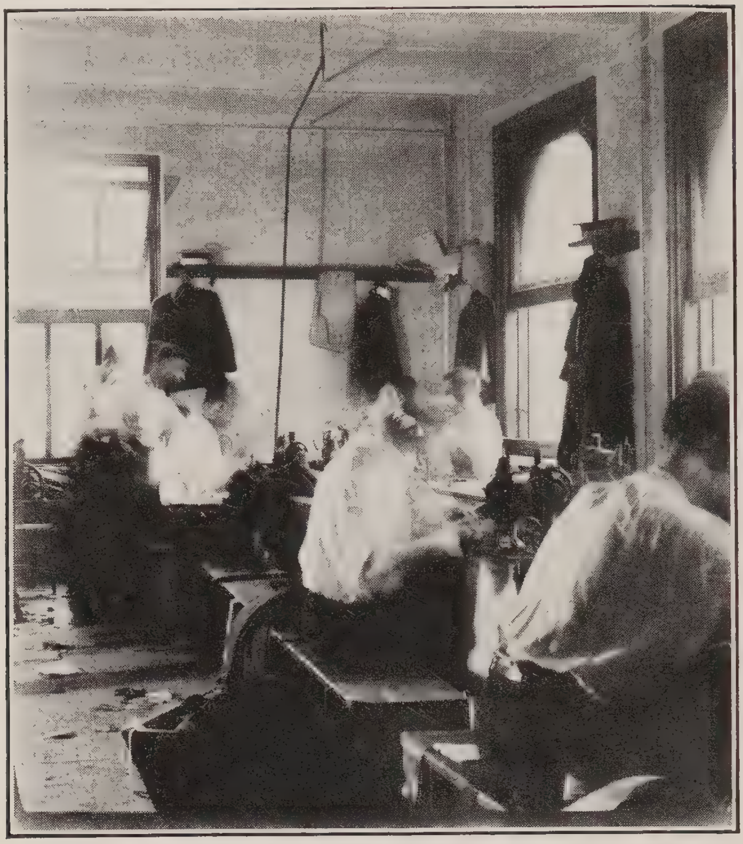


Fig. 3.—Fishtail burners used in the illumination of machines. The flickering of the flame and the glare from its proximity to the eye make this form of artificial illumination very undesirable.

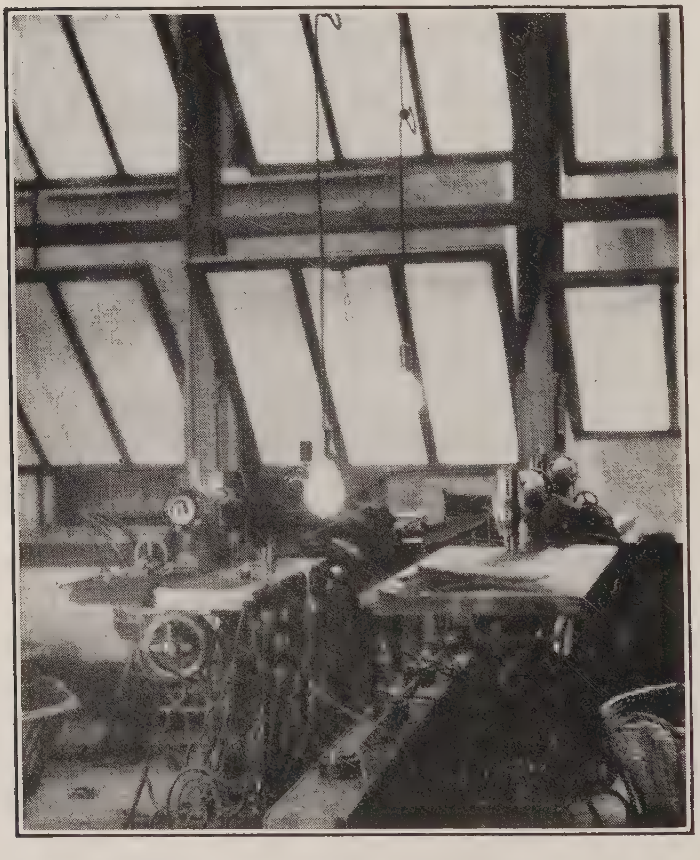


Fig. 4.—Bare lamps used in the illumination of machines. Deep bowl or cone reflectors should be used.

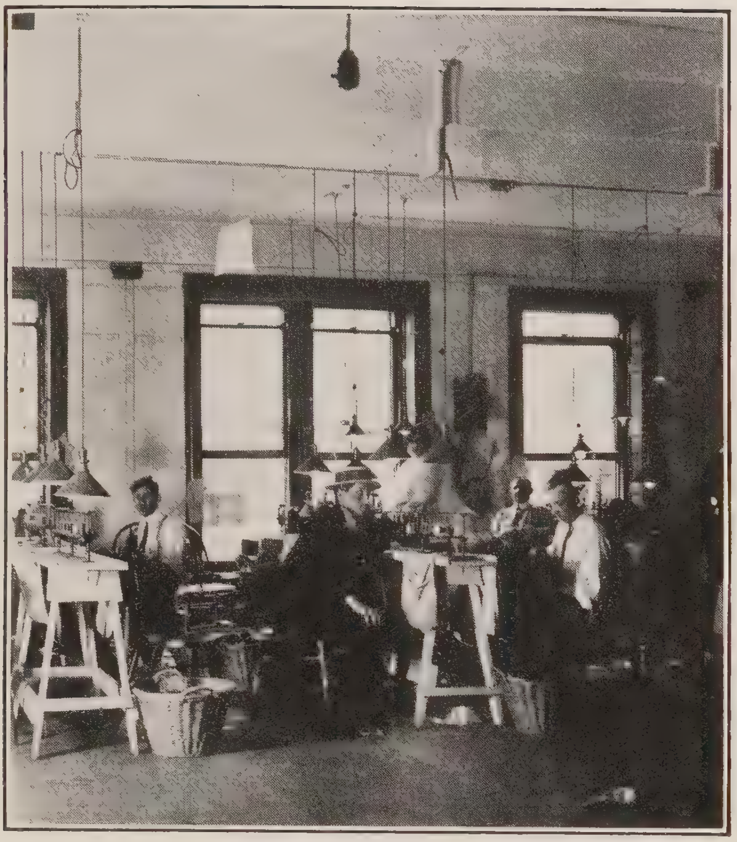


Fig. 5.—Finishing tables. Lamps project below reflectors. The daylight illumination was good.

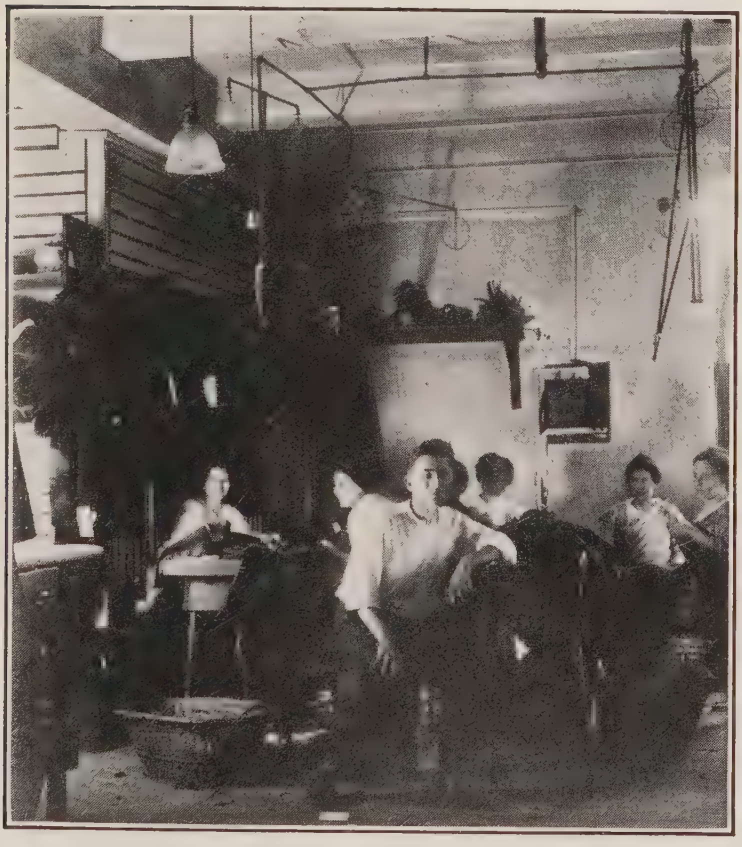


Fig. 6.—Finishing tables, shop No. 10c. Artificial light provided by fishtail gas burners. These let down when in use.

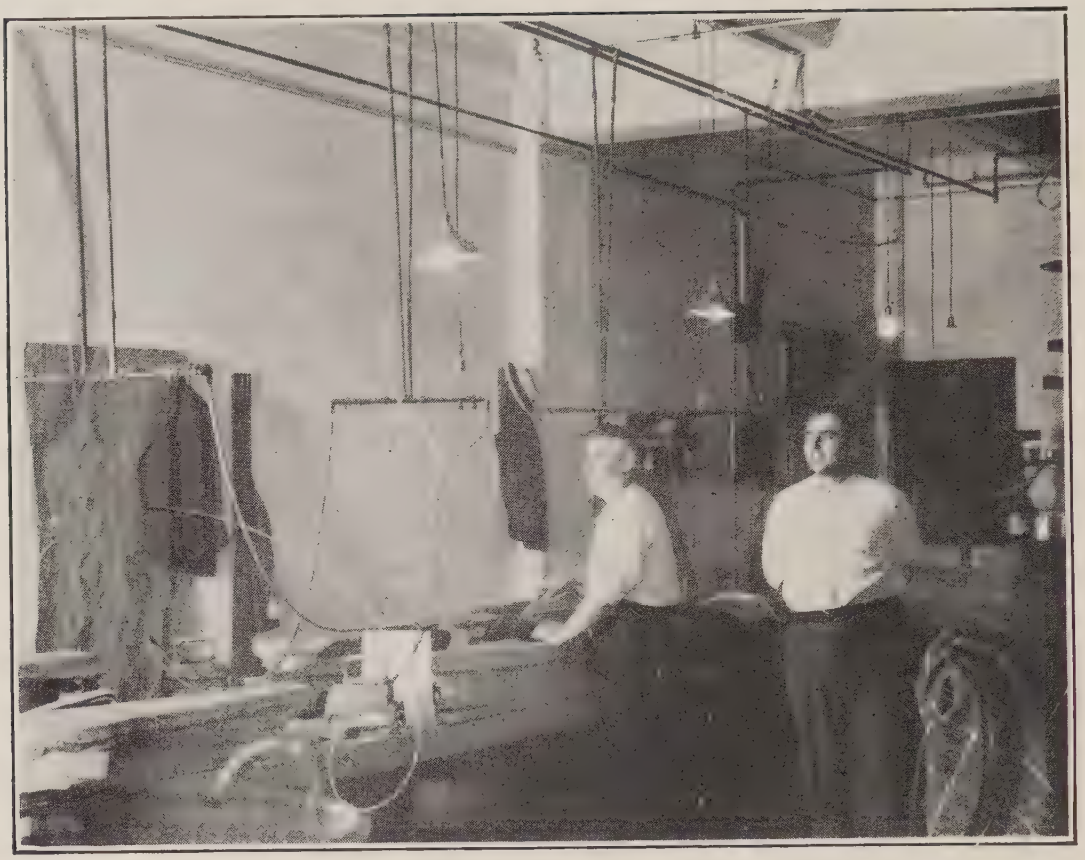


Fig. 7.—Illumination of pressing table. Projecting filaments and bare lamp.

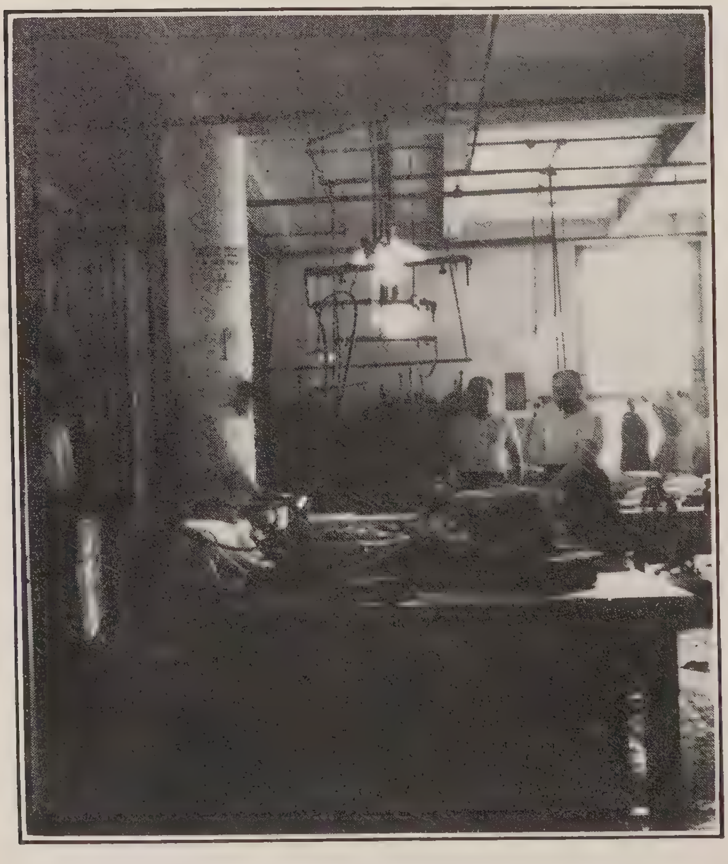


Fig. 8.—Illumination of pressing tables, shop No. 8. Shallow saucer reflectors permit glare effects from exposed lamps.

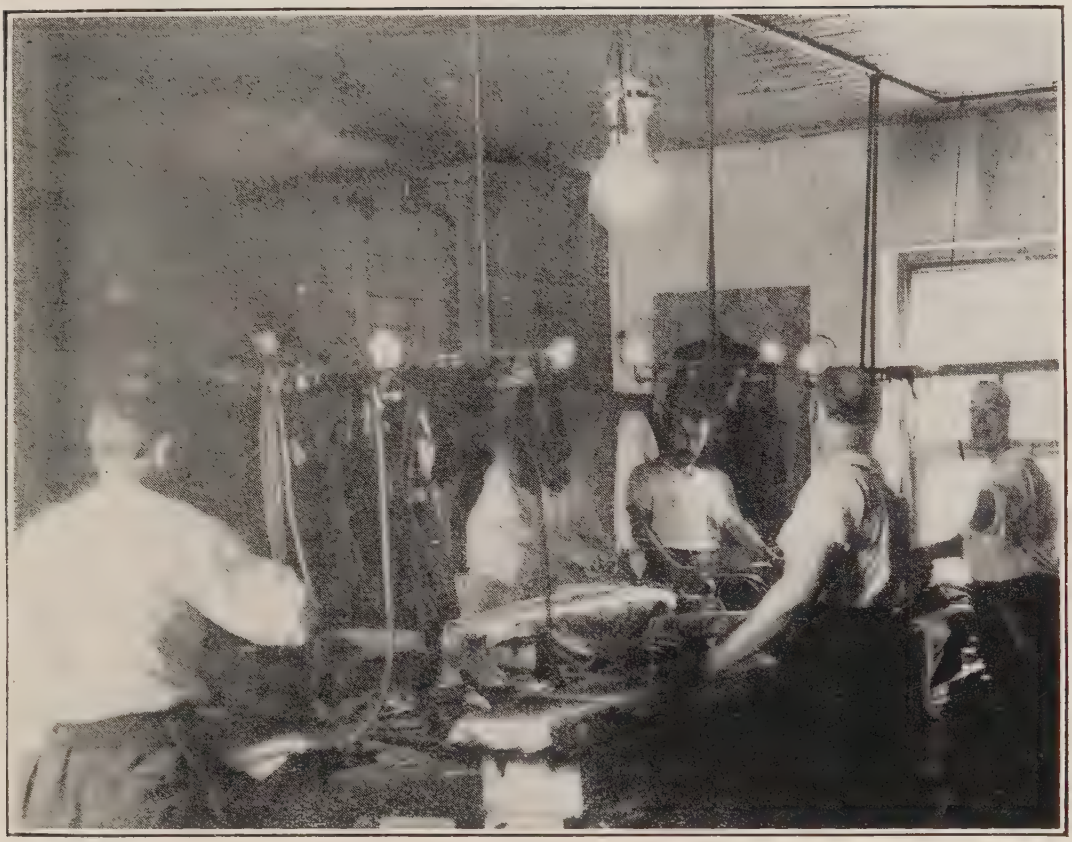


Fig. 9.—Illumination of pressing tables, shop No. 12. Gas arc in clear globe and low suspended fishtail burners produce glare effects.

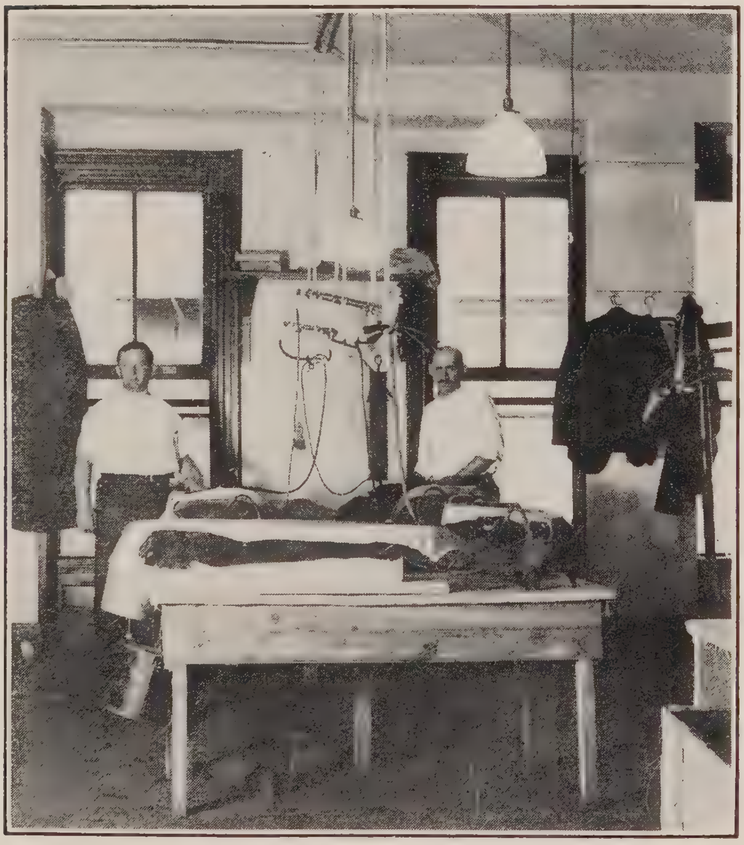


Fig. 10.—Pressing table, shop No. 11, with opal extensive bowl type reflectors, 250 watt tungsten lamps. The illumination was good. The lamps are well out of the visual field of the worker.

connection with 8-inch conical tin reflectors. The lamps used were ten 60-watt Tungsten bulb S–24½ (large bulb), two 100-watt Tungsten, and one 50-watt Gem. The average height of suspension was 1.71 feet with an average angle of glare of 84° when the attention was concentrated on the work in the laps of the finishers.

Photograph No. 6, shop No. 10c, shows a typical arrangement of two finishing tables centrally located with respect to the windows. The daylight illumination was measured at 2.45 p. m. on July 14. The sky was overcast with 90 per cent nimbus clouds and the sky angle was 82°. The illumination was 3.2 foot-candles average, 5.8 foot-candles maximum, and 2.4 foot-candles minimum. The windows faced north on Twenty-sixth Street. The opposite buildings were light gray in color. This shop was on the twelfth floor.

There were 4 flat flame 6 cubic feet per hour gas lamps over each table. These lights were provided with an elbow joint and were swung up when not in use. These lamps when in working position were at an average height of 0.33 foot from the table top giving an angle of glare of 50° with the eye fixed on the work held in the lap. This angle became practically zero when the head was raised.

Photograph No. 7, shop No. 18, shows a typical arrangement of centrally located pressing tables. The daylight illumination was measured at 2.35 p. m. on July 23. The sky was clear and no clouds present. The sky angle was approximately 0°. The average illumination was 0.32 foot-candle with a maximum of 0.67 foot-candle and a minimum of 0.11 foot-candle. The windows faced north on an alley. The opposite buildings were dark gray in color. The shop was on the second floor.

There were 3 outlets for artificial lights all of which would light. The units consisted of 60-watt Tungsten lamps S–24½ bulbs fitted with 10-inch conical tin reflectors. The average height of suspension was 5 feet with an average angle of glare of 115°, when the attention was concentrated on the pressing boards. Artificial illumination was not used at the time of measurement. It was, however, measured and the values found to be 2.4 foot-candles average, 4.2 foot-candles maximum, and 1.1 foot-candles minimum for the combined daylight and artificial light.

Photograph No. 9, shop No. 12, shows a typical arrangement of a pressing table located perpendicular to a window. The day-light illumination was measured at 3.10 p. m. on July 16. The sky was clear with no clouds. The sky angle was 73.5°. The average illumination 6.1 foot-candles with a maximum of 20.5 foot-candles, and a minimum of 0.65 foot-candle. The window faced on an air shaft and the opposite buildings were red brick. The shop was on the fifth floor.

Artificial illumination was supplied by one 4-mantle gas arc with 13 cubic feet per hour consumption and six flat flame 6 cubic feet per hour gas lamps. At the time of measurement the mantles on the gas arc were broken and it was not in use. The average height of suspension of the flat flame lamps was 2.2 feet with an angle of glare of 65°.

Photograph No. 10, shop No. 11, shows a fairly good artificial lighting arrangement for tables located perpendicular to windows of approximately 0° sky angle. The shop was on the third floor.

Two units were employed for the artificial illumination of the table. These units were made up of 250-watt Tungsten lamps in Nubolux No. 560, 11-inch diameter reflectors. The height of suspension was 3.4 feet with an angle of glare of 79°. Artificial illumination was used constantly on the pressing tables. Its effect, combined with that of the daylight, was to produce an illumination of 7 foot-candles average, 15.2 foot-candles maximum, and 1.2 foot-candles minimum.

APPENDIX G.

EXTRACTS FROM NOTES ON ILLUMINATING DEFECTS FOUND IN SHOPS.

The following extracts from notes of working conditions found during the survey will serve to give an idea of the more common faults observed:

NOTES ON SPECIFIC SHOPS.

Shop No. 4.—The flat-flame gas lamps in many cases had fouled and broken tips, distorting the shape of the flames. When gas mantles on the gas arc lamps are broken with resulting low efficiency in operation, the mantles are not replaced as long as there is any remaining. Four-burner gas arcs were in use with from one to three mantles broken off.

Shop No. 9.—In this shop an electrician is employed to keep the electrical apparatus in repair. The reflectors and lamps are dirty, sockets are broken, lamps are burned out and blackened, and lamps of dimension too large for the reflectors are in use. In order to illustrate to the electrician in charge the gain in illumination that could be made by keeping the lamps and reflectors clean, illumination measurements were made, in his presence, using a C–10 reflector and a 60-watt small-bulb tungsten lamp. From measurements with the reflector and lamp dirty and with the same reflector and lamp washed clean an increase of 27.5 per cent in illumination was found.

Shop No. 13.—All lamps in this shop were without reflectors. A 50-watt bare carbon lamp over the owner's desk gave an illumination of 2.9 foot-candles. With a suitable reflector fitted to the lamp the illumination measured 9 foot-candles. This test was made in the presence of the owner of the shop and illustrated to him the economy effected by the use of proper reflectors. There are several unused dress racks in this shop made of ½-inch iron pipe. The base of these racks is constructed of black iron pipes parallel to the floor. There is head room of 6 feet. Employees have stumbled over these pipes and have been hurt several times. The illumination measured here was 0.95 foot-candle. If the illumination was raised at this place accidents might be avoided.

Shop No. 15.—In this shop the basting table is placed against the partition which separates the cutting room from the rest of the shop. The partition is made up of slats 2 inches wide. There are no lights over the basting table. When the lights in the cutting room are burning, alternate strips of shade and shadow are produced on the basting table whose brightness ratio is 1 : 4. The lamps in the cutting room are suspended by drop cords. When these swing, the strips of shade and shadow move along the basting table.

Shop No. 16.—In this shop a thunder shower came up at 4.30 p. m., and on working planes where the electric lamps were missing or burned out, the illumination was decreased from 106.5 foot-candles before the storm to 2.5 foot-candles during the storm. Attention of the shop owner was called to this condition and the necessity of maintaining lamps and equipment in good condition explained.

Shop No. 17.—In this shop the owner has recently moved in. He has been at considerable expense in installing conveniences and sanitary appliances. Knowing nothing of proper illuminating methods, he employed a local electrician to design and install his illumination. The electrician placed fixtures similar to those in common use in the garment trade. As he was not familiar with the meanings of the terms "distribution" and "glare," the lighting arrangement is very unsatisfactory.

Shop No. 23.—This shop employs electric irons on the pressing table. Fifty-watt bare Gem lamps are used as pilot lamps. The lamps cause glare effects because they are placed along the center line of the table at the height of the eye. They should be placed outside of the field of vision.

Shop No. 30.—In this shop ribbed glass is used in the windows. The ribs are perpendicular instead of being parallel to the floor, as they should be, in order to refract light to the interior.

Shop No. 33a.—Complaint was entered to the Joint Board of Sanitary Control by the operators to the effect that the illumination was inadequate. Upon investigation it was found that the illumination on 72.5 per cent of the machines was below 5 foot-candles, the average being 2 foot-candles. The lights on the machines were 6 cubic feet per hour flat-flame gas burners equipped with wire baskets. The material being worked upon varied in albedo from 1.81 to 75.3 per cent. The material frequently came in contact with the wire baskets and gathered soot from the smoky flame of the lights. The lamps were poorly spaced. The angle of glare at the needle was 82° and was decreased to 0° when the operator looked up from the needle to make cloth and machine adjustments.

Shop No. 34.—In this shop the north windows are blocked by the walls of a new building 4 feet from the windows. In the part of the shop illuminated from these windows there are 22 machines, 2 cutting tables, 2 finishing tables, and 1 pressing table. There is no systematic artificial lighting arrangement. Bare tungsten and Gem lamps are scattered about with no regard to distribution.

Shop No. 11a.—In this shop one window of the cutting room is equipped with factory-ribbed glass. Measurements were made to determine the gain in illumination made by using the ribbed glass. At 15 feet from the window the illumination was 22.2 per cent greater for the factory-ribbed glass than for $\frac{1}{8}$-inch window glass. The sky angle was 8.5°.

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